JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES—GAS, &c.

Technical Arrangements for the Glasgow Meeting.

THE programme for the Glasgow meeting of the Institution of Gas Engineers is practically completed; and we are able to give now, from information supplied by the Secretary (Mr. Walter T. Dunn), an indication as to the technical subjects that will claim the attention of the members. On the strength of the technical programme, the Council are to be heartily congratulated—both in regard to the subject-matter and the authors of the papers. The names of the latter give quite sufficient promise that the qualitative character of the contributions will rank high; and the titles alone foreshadow material that will provoke good discussions. Practically every item treats of one or other of the matters that are very much in the technological atmosphere of the industry at the present time. Largely the subjects are of engineering and manufacturing import; but the commercial side is not altogether neglected, though the balance is heavier on questions lying within than outside the works. Carbonization will stand predominant; and, for the first time before the Institution, we shall be having the actual experiences and results, under British conditions and independent of the originators of the systems, of the working of the three different types of vertical retort-settings that have been prominently before the industry. It may therefore be taken that what is presented in this way at the present meeting will form, through this concentration of home experiences and results, a fresh starting-point in the consideration of the vertical retort question, and that much of what has hitherto been published may be discarded in favour of what will be submitted on this occasion, though in one or two instances the systems represented by the home installations that will be before the members have, subsequent to their erection, undergone modification. For example, the Dessau system at Sunderland is not the latest design in the matter of the number and size of retorts per bed; and from the modified setting, results have been obtained in Berlin superior to what were formerly realized with the previous form of setting. We believe, too, that the latest settings on the Woodall-Duckham system have incorporated in them a few details somewhat different from the Burnley settings; but upon this point we cannot speak with certainty.

It may be almost definitely said that the Presidential Address of Mr. Alexander Wilson, the official head of the Corporation Gas Department of Glasgow (the Committee of which, with their genial Convener, are anticipating the visit of the Institution with considerable interest), will contain, as an outstanding feature, information on the vertical retort system that he has developed, and which has thrust itself between the continuous and the intermittent systems. It cannot properly be called either the one or the other; and in the absence of a better name, it has been designated the continuous-intermittent system. But the principle is really one that provides for short-period intermittency, by partial discharge and partial charge, so that at no time is the top half of the charge in the same advanced stage of carbonization as the bottom half. The President has been very modest about his work in this direction; and he has always impressed upon the visitors to his works that he has had, in designing and perfecting this system, a single eye to one that would serve Glasgow conditions and the classes of coal used there. With the competing carbonizing systems all producing high-class results, the question of the choice of a carbonizing system is one of particular importance to gas engineers to-day. This remark covers the title of the paper by Mr. P. C. Holmes Hunt, of Melbourne; and it may be surmised that he will state the considerations that resulted in the choice by him (ratified by two independent gas engineers) of the Dessau system for the new installation of carbonizing plant at Melbourne. Unfortunately, distance will preclude Mr. Hunt's attendance at the meeting. However, Dessau vertical retorts have been in use at Sunderland now for some time; and Mr. Charles Dru Drury, who, as the responsible Engineer, has kept them under close observation, and has put them under varied trial, will no doubt have a most interesting narrative of experiences to present. The same remark applies to the contribution that will be made by Mr. John P. Leather. This will deal with the Woodall-Duckham system, as installed at Burnley, which installation has been running now for a considerable time under Mr. Leather's immediate surveillance. In addition to all this, Mr. J. G. Newbigging will treat of the scientific carbonization of coal. He was the first gas engineer in this country to put into operation outside St. Helens an installation of the Glover-West system; and though the title of the paper to be read by him does not supply any indication that he will deal specially with this plant, it has been an open secret that his investigations into its working—at Manchester, and so removed from the place of its birth—would form the basis of a contribution to the proceedings of the Institution. There will be considerable interest in this; and it will bring into line published independent experiences and results with the three prominent vertical retort systems. Reports are also promised by the Carbonization Committee and by the Refractory Materials Committee, so that the retort-house will have a remarkably good innings on this occasion.

Engineering questions will not end with carbonization. Mr. C. F. Broadhead, of Middleton, should, through a description of his work in modernizing a medium-sized gas undertaking, raise a good discussion. We hardly know where Mr. Bernard F. Browne is going to take us among the divers topics that claim the attention of gas men. The title of his paper does not afford guidance. But anyway he is proposing to invite us to transfer our thoughts from home conditions of gas supply to those obtaining in South America. He will have a hearty reception, and an interested audience, as there is always something fascinating in learning first hand from men with the personal experience (such as Mr. Browne obtained in Buenos Ayres) of the conditions in which they pursue, or have pursued, their professional work in such far-off places as Brazil. Mr. James M'Leod, of Greenock, will turn the channel of thought into the distribution department, when he deals with that sore point of the corrosion of service-pipes. Here, again, we have as yet no indication as to the line the author will take; but it can be imagined that, if not in the paper, during the discussion, the word "electrolysis" will occasionally be heard. An opportunity will be afforded by Mr. S. B. Langlands, of Glasgow, for the expression of several views on that extremely polemical subject of public lighting. Many gas engineers have seen what is being done in London with the high and low pressure inverted gas-lamps; and we hope that, before the Glasgow meeting, as many as possible will take an opportunity of inspecting the lighting at the Crystal Palace, which famous place is now to be quickly reached by the electric service of the London, Brighton, and South Coast Railway from Victoria. Not the least important contribution to the proceedings will be that of Mr. E. W. Smith, M.Sc. He has had at Birmingham, as technical officer of the high-pressure gas section of the Corporation Gas Department, a unique experience in the application of high-pressure gas to industrial purposes; and this is a subject that is demanding increasing consideration from the technical men of the industry. The question of gas heating will also be introduced by a further report from the Gas-Heating Research Committee.

It is a full and promising technical programme that will engage the attention of the members when they assemble, from the 13th prox., in the Glasgow and West of Scotland Technical College (by the courtesy of the Governors of the Institution). It is pretty safe to say that there will not be an uninteresting or dull moment throughout the proceedings next month.

A Festival of Light.

A NOTABLE feature of this issue of the "JOURNAL" is the descriptive account, with illustrations, of the fine and unexampled display of high-pressure gas lighting and of electricity generation by town gas that is now to be seen at the Festival of Empire Exhibition and Pageant of London at the Crystal Palace. It is the "exhibit" for the year for the gas industry; but provided entirely through the success of the South Suburban Gas Company in securing the big contract in competition with the local purveyors of electricity. We have in the article elsewhere congratulated the Chairman (Mr. Charles Hunt) and the Directors of the Company upon their enterprise. But it is for them to accept or reject a new business project; and if there be acceptance, then to command that it be carried out. The responsibility for bringing about the consummation of the large contract fell, in the ordinary course of things, upon their chief executive officer—the Company's Engineer and Manager (Mr. S. Y. Shoubridge); and he has been aided by many assiduous workers and willing contractors. We have had an opportunity of watching the development of the scheme practically from its inception to the present; and though time was brief in which to compass all the considerable and heavy work entailed, everyone concerned, we can testify, has worked with a heartiness that indicated he felt that honour and reputation demanded that the work should be done so that both light and power were available well by last Friday—the opening day of the Exhibition. So excellently did the Gas Company's men do their part, Messrs. Keith and Blackman theirs, the National Gas-Engine Company theirs, and the minor contractors theirs, that lamps were running and trials were being made with the electric power some time before the formal inauguration of the exhibition. The northern part of the interior of the Palace was, in fact, illuminated by high-pressure gas-lamps nearly four weeks since, and the lamps in the grounds have, during the pressure of the past week's work, enabled the men in the various parts of the Palace and grounds to pursue well into the night the preparations for the inauguration of the exhibition by their Majesties the King and Queen. A fortnight or more since, one of the three powerful "National" gas-engines was at work providing the electrical energy needful for the trial running of the "All Red Route" Railway. And by the opening day, all was ready for giving both lighting and power—complete so far as the gas lighting goes, and with power for the railway, &c., but not for the electric illumination of the pavilions.

What is it makes this display at the Festival of Empire Exhibition of so much importance and interest to the gas industry? In the first place, the occasion alone is sufficient for the fullest satisfaction that the main lighting of the grounds and of the northern half of the Palace is by means of the most advanced method of lighting by high-pressure gas. But there are other reasons. Never before has there been such a large display of illumination derived from high-pressure gas-lamps—ranging in power from 4500 candles down to 1500 candles per unit—concentrated in such an area, and under such unique conditions. Here we have from high-pressure gas-lamps alone an aggregate of 657,000-candle power distributed about the grounds, and 107,600-candle power distributed about the Palace, to say nothing of such isolated installations as the five 4500-candle power lamps outside the main entrance of the Palace, the lamps at other entrances, and in the gas-driven power house. The richness of the illumination, the excellent diffusion everywhere, the steadiness of the light, are merits that draw much public admiration, but are a source of exceeding vexation to those who have displayed in the past a considerable amount of ignorance or of mental aberration by talking of the gas industry being in process of obsolescence and decay.

What is a further consideration that makes this display at the Crystal Palace of so much importance and interest to the gas industry? The contract secured by the Gas Company, as we have stated, includes the provision of the power necessary for the generation of electricity required for the "All Red Route" Railway, the side shows, illuminations, and the interior lighting of the pavilions; and the great engines, of the "National" vertical type by which the Company are complying with this part of the contract, are, to the best of our knowledge, the largest in the country that are driven by town gas. This is a point of engineering interest. And with these the Gas Company gained the contract in competition with the local Electricity Supply Company! This is a point of commercial interest. But let it be clearly understood that the Gas Company are not supplying electricity. Their contract only embraces the provision of the power plant for generating it, and for the driving agent for the plant—the Festival of Empire Exhibition authorities being the purveyors of the energy produced. It is owing to this, and to the fact that a good load is required for the plant in the power house that, for interior lighting in the pavilions in the exhibition, the means of illumination will, generally speaking, be electrical.

It is anticipated that many whose interests are largely concentrated in the gas industry will be visiting the Palace specially to view this magnificent display of high-pressure lighting and electricity generation by town gas actuated engines; and in view of such visits, the ample description and illustrations that are published in this issue will, it is hoped, prove of much value and assistance. Certain we are that there will be endorsement of our view that the whole of the lighting and power installations is a triumph for gas.

Street Lighting.

Two or three interesting points in connection with street lighting were introduced at the annual meeting of the Illuminating Engineering Society last Tuesday. The meeting brought to a close a session that it is undeniable has had value in furthering the claims of illumination to be treated on a more scientific basis than hitherto. This is the cardinal ambition of the Society—to advance those claims by work independent altogether of commercial interests. It is hoped also that indirectly the work will assist in bringing about pacification between those interests. However genuine and laudable the hope, we fear that, where competitive trading interests are concerned, it is altogether too ambitious. In truth, we think that it would not be altogether in the public interests that the desire, however pious, should be fulfilled. The man who lives in the realms of science may not see this; but those among us who move and have our being on the lower planes on which competition is rife, know full well that it cannot be. The competitors may work together to advance scientific knowledge; but there they must-- it is inevitable—part company.

Dr. Thompson, the President of the Society, in a short extempore address to the members, acknowledging a vote of thanks, alluded indirectly to what he termed the conjoint street-lighting project that has been submitted by the Gas-light and Coke Company and the Electric Light Companies to the Holborn Borough Council. He seemed, in his mind, to be connecting up in some way this joint scheme with the work of the Society. He said, in effect, that he had not thought it would have been possible in so short a time as eighteen months, since the Society was founded, to have had a serious project for street lighting laid before a municipality conjointly by gas and electric companies. He would not discuss the merits of the scheme, but because it was conjoint, he welcomed it. We are afraid that no influence direct or indirect of the Society was brought to bear upon this scheme. The scheme was not the child of any golden feelings of amity. It was due solely and particularly to an unconquerable set of conditions that brought the parties together for the mutual defence of their respective commercial interests. It was a case—acting singly—of winning a contract and losing upon it for either party; and it was to escape from the *cul de sac* in which they found themselves that the joint scheme was conceived, framed, and submitted to the Council. Nor do we agree with Dr. Thompson that it should be possible for each illuminant to have a basis for its own work—at least not any definite basis. Electricity would not be content to have what was left after gas had taken all that it is possible for it to do more economically and efficiently than electricity; and gas certainly would not be content to have what was left after electricity had taken all it thought it had a right to. "To do work conjointly "instead of by hostility would be a great thing indeed." Mayhap it would; but the Millennium is afar off.

One other matter. The report of the Council referred to the question of the framing of a street-lighting specification. At the instance of the Institution of Electrical Engineers, a Committee has been formed composed of members of its own body, of the Institution of Gas Engineers, the Illuminating Engineering Society, and the Association of Municipal and County Engineers. Meetings of the Committee, it is stated, are being held, with the view of attempting to arrive at some common ground of agreement before

drawing up a tentative form of specification. We quite agree that the adoption, even tentatively, of a street lighting specification such as would meet with common acceptance, would be of considerable benefit in forming a basis of agreement as to what constitutes good street lighting. So agreeing, we wish the Committee a happy issue out of their deliberations. But after the Committee, what then? A specification coming before local authorities with the imprimatur upon it of the leading technical organizations interested in the competing lighting agents may have weight in certain quarters. But street lighting will still have to bow largely to local conditions, to the whims and fancies of the members of the jurisdictive bodies, and to their view as to the raising or lowering of the lighting rate. We shall look with interest to the coming of the proposed specification. It will have the careful consideration that a proposal of the kind deserves, coming from a body of men who mean serious business.

Compulsory Health and Unemployment Insurance.

Labour has little cause to complain of the attention that the Government are giving (in some ways rightly, and in other ways questionably) to their wants and requirements and to the advancement of their conditions. But the rate at which this is being done, and the burdens that the new order of statutory enactment is imposing upon industry and trade, must have the grave effect of killing, by the very weight of compulsory obligation, the vast amount of voluntarily conferred advantages on the part of employers to employed such as exist in the gas industry. This, we feel confident, must be one of the results of the proposed compulsory health and unemployment insurance, though the latter has at present only a suggested partial application. But there must come a point where the employer cannot longer stand the infliction of additional burdens, and will have to curtail his gratuitous concessions in order to meet the compulsory exactions. Take gas undertakings who have in existence co-partnership schemes, sickness funds, pension and superannuation funds, holiday allowances, and so forth, and who, in addition, have to bear the obligations imposed by the Compensation Acts and the Employers' Liability Acts, rates under the poor law, and the proportion of the rates that fall upon them in connection with old-age pensions, education, free libraries, baths and washhouses, recreation grounds, and in other ways. There is a limit to the financial weight that these concerns can bear in the interests of labour for which they find so much employment, and for which they, as a rule, make ample provision, in respect of that part in their direct employment, for times of sickness or disablement, old age, and in other ways. When the employees of such concerns come to consider the possible effects of the amount of State interference between employer and employed, we think they will wish that where "well" privately exists there "well" should be scrupulously left alone by the State; and we are not altogether sure, too, that, when labour weighs all the effects, and considers the amount of compulsory contribution under the proposed new National Insurance scheme, it will not start some resentment on its own account. From the individual point of view, compulsion and rigid State control in such matters as these cannot possibly be good for the individual. It must cut at the very roots of personal responsibility, thrift, and self-reliance.

However the long-promised Bill for "Insurance against "loss of health and the prevention and cure of sickness, and "for insurance against unemployment, and for purposes in-"cidental thereto," as introduced to the House of Commons by the Chancellor of the Exchequer, is now before us. It has been well received by the House; and therefore it is likely—perhaps before the session is through—to become law. The Bill is an extensive one; and it is difficult to deal with it in detail. We are, however, with those who think it would have been wiser (perhaps this will even yet be done) to have separated the part referring to health from that which deals with unemployment, inasmuch as the one has general application to all employees excepting salaried ones in receipt of over £160 a year, while the other has not With the principles underlying the Bill, no humane person will quarrel. The objectionable features are the compulsion, the unfair incidence of such compulsory burdens, the supersession of individual and of voluntary endeavour, and the further severance that must ensue between capital and labour by their relations and conditions being fashioned in a State-designed mould. There might surely be allowed in a case of this kind some sort of elasticity or exemption, under proper supervision, in regard to the health and sickness section of the Bill, for such semi-public authorities as (say) gas companies, or at any rate for those who already make large provisions for their employees. But, so far as we understand the Bill, there is not much (if anything) in this way. At the same time, we see where some amount of inconsistency may arise as between municipal gas undertakings and gas company concerns. It is found under "Exceptions" in the very first schedule; and one exception is: "Employment under the Crown or any "*local or other public authority* where the Insurance Com-"missioners certify that the terms of the employment are "such as to secure provision in respect of sickness and "disablement on the whole not less favourable than the "corresponding benefits conferred by Part I. of this Act." Why should there be (if we interpret the meaning correctly) this distinction between (say) the gas trading department of a local authority and a gas company, or between a municipal electricity department and a competing gas undertaking? However, in clause 56 of the Bill, there is some little recognition that an employer is not likely to pay twice over for the same purpose, and that therefore he may, if he desires, submit a scheme to the proper authority in respect of the matter, in accordance with these conditions:

> Where, at the passing of this Act, a superannuation fund, or any similar fund, has been established by an employer for the benefit of the workmen employed by him, and under the Act or deed establishing the fund any sum is payable by the employer towards benefits secured by the Act or deed, and those benefits include benefits similar to those conferred by this Act, the employer may, at any time before the commencement of this Act, submit to the registrar a scheme allowing him to deduct from any contributions payable by him under the Act or deed towards benefits of a nature similar to those under this Act, the amount of the employer's contributions payable by him under this part of this Act.

The Bill is also one-sided, and against the employer, in respect of his responsibilities under the Compensation Acts and Employers' Liability Act. The funds under this national health insurance scheme will not (why should they not if compensation or damages are incurred through accident caused by no negligence on the part of the employer?) be utilized for compensation or such-like purposes. Where, however, sickness or injury results in compensation or damages being paid by the employer, if the weekly sum so paid, or the weekly value of a lump sum so paid, is equal to, or in excess of, the benefits under the present scheme, the employee will have no sickness or disablement benefit under the scheme; and if the weekly value of the compensation or damages is less than the benefits to which he would be entitled under this measure, then the employee will only be paid the difference from the insurance funds to make up the amount of benefit to which he is entitled. In this way, the national insurance fund will benefit at the expense of the employer who has to pay compensation or else damages. The measure incorporates precautions against any collusion between employer and employed in respect of obtaining maximum benefit to the saving of compensation and damages.

The conditions and rules that are to apply to the funds under the health insurance section of the Bill, from contribution and collection to administration under insurance commissioners, are extensive and weighty to master; and it is hoped that the Government will provide ample time for their discussion, in view of the increasing discovery of defects, and also of the injustice that the application of the scheme if not modified would have upon existing conditions and interests. We will not enter upon even a broad outline of the health insurance scheme here beyond noticing that the contribution to the fund per man is to be 7d. per week, of which the employers are to pay 3d. and the men 4d. —the employer being responsible for the proportion of the men's contributions, and being authorized to deduct it from wages or salaries. For defraying the expenses of the administration of the benefits, the money is to be provided in the case of men as to seven-ninths from the contributions made by themselves and their employers, the remaining two-ninths being provided by Parliament. Administration of the funds is going to be a costly thing. Among numerous minor provisions is found all the machinery necessary for enforcing compliance with the proposed enactment. The section of the Bill referring to unemployment insurance (the financial contributions to which are quite apart from those referring to sickness and invalidity) can stand over for consideration in a further article.

The Edinburgh Catastrophe.

Ten lives lost, many thousand pounds' worth of property destroyed, and the business of the Edinburgh Empire interrupted for several weeks. Cause: A fused electric wire. The cause seems little enough; the consequences are terrible to contemplate. Although small at its inception, this particular cause of fire is perhaps the most insidious of all. Without warning, a wire becomes overheated; it fuses; and, unless one absolutely sees what is happening, the flame creeps along the insulation of the wire, and so assists in creating large conflagrations with remarkable swiftness. We have seen flame creeping silently along the insulation of an electric wire that has fused, and so can realize how subtle can be electrical action in the generation of fires. There is no mystery about this life-destroying fire at Edinburgh; and we have not heard that Mr. Renwick, of the Electricity Publicity Committee, has troubled to telegraph to Edinburgh to get what is commonly called by his electrical friends authoritative information on the subject, which "authoritative information" is generally to the effect that there is no ground for suspecting electricity. Not only is there ground for suspecting electricity on this occasion, but the evidence of those who were on the ill-fated stage at the time is incontrovertible as to the origin of the outbreak. One of the eye-witnesses who was up among the scenery saw a portion of an electric wire red hot that was connected with an oriental lamp fitted with an electric bulb. That same eye-witness saw the flame run up the electric wire; but before he could give the alarm, a canvas 40 feet by 30 feet was on fire. The rest of the tragic tale is well known.

It is stated that arrangements are being made for an investigation into the catastrophe under the Fatal Accidents Inquiry Act. For such an inquiry in the public interests, there are two good reasons. The present fire proves the insufficiency of the precautions where electricity is used among the gossamer paraphernalia of the stage; and it also shows that where such large numbers of people are assembled, electricity ought not to be relied upon solely for lighting. In this instance, the Edinburgh and other newspapers state that the lights went out suddenly, and the place was in darkness, and the chances are that had this not been the case, the loss of life would not have been so great. It is a marvel how the large audience were cleared from the building without, among the great number, some loss of life or personal injury—artistes and employees alone making up the appalling death-roll. Only in December last there was a bad failure of the electric current in Glasgow in which places of public assembly were involved. But the manner in which theatre and music hall stages are electrically lighted is really a serious question for consideration in view of the character, the quantity, and the position of the combustible material that is about. There are stages where there are (say) three arc lamps swinging about at the back of the stage, and violently so when scenery is being shifted; and it is not an infrequent thing for incandescent lamps fixed to battens at the top of the stage to explode—possibly owing to the rough treatment that they receive through the violent vibrations and knocks that hasty scene shifting must produce. However, the tragic occurrence at Edinburgh supplies more than sufficient cause for thorough investigation into the protection of the public, artistes, and employees generally in theatres and music halls exposed to the dangers of fusing wires and to failures of current.

Cheaper Gas for Birmingham.

Gas matters in Birmingham have of late been much under notice; and there is no reason whatever to suppose that this is a state of affairs which will not continue. The work that is being done in connection with high-pressure gas has on several occasions been referred to in these pages; and its important character has been freely recognized. That it will lead to extended developments in the future—both in Birmingham and elsewhere—is confidently anticipated. Much energy and enthusiasm are in evidence among the officers of the department in dealing with the different problems confronting them; and their efforts will be assisted by the determination of the Committee to reduce the price of gas, in view of the satisfactory nature of the accounts and the favourable outlook for the future. Under the new scale (which will come into force after the June reading of the meters), small consumers for lighting, heating, and domestic purposes will be charged 2s. 2d. per 1000 cubic feet for their gas, instead of 2s. 4d.; and the rates are reduced from this figure step by step, according to consumption, until a minimum price is reached of 1s. 3d. per 1000 cubic feet, which is subject to 5 per cent. discount for prompt payment, making the net charge just about 1s. 2¼d. For manufacturing and motive power purposes, the initial price is 1s. 6d. per 1000 cubic feet, for consumptions under 1,000,000 feet per quarter; the reduction being 1d. per 1000 feet on the total consumption for each additional 1,000,000 feet or portion thereof, until the minimum of 1s. 3d. per 1000 feet is reached. A concession is to be made to prepayment consumers; and the Committee further recommend that the few meter-rents now charged should be abolished, except where additional meters are required solely for the consumers' own purposes, &c.

Record Profits and Vertical Retorts at St. Helens.

Gratification and congratulation were the salient features at the meeting of the Gas Committee of the St. Helens Corporation last Wednesday—the former at learning from the Gas Engineer and Manager (Mr. Samuel Glover, M.Inst.C.E.) that the profits realized by the working of the gas undertaking in the past financial year constituted a record in its history; and the latter as a well-merited acknowledgment of the ability displayed by the official named in the production of this result. The few particulars to be found in another column show the extent of the increase in the profits and in the make of gas in the past year; and therefore it is unnecessary to give the figures here. It may, however, be mentioned that the excellent returns obtained from the sale of residuals helped materially to make the total. This was not specially noteworthy in connection with last year's working, as for several years the net income from residuals has been more than sufficient to pay for the whole of the coal used and the enrichment of the gas produced from it. The Corporation supply 18-candle gas, as tested by the "Metropolitan" No. 2 burner; and it has been thoroughly purified and put into the holders at less than 6d. per 1000 cubic feet. The Committee were exercised as to how to allocate the profits made. While they recognized that their ability to hand over the round sum of £5000 relieves the Finance Committee considerably, they knew that if this sum had to be obtained from the sale of gas it could not be done at the present price, which includes rent-free meters, cooking-stoves, heaters, &c. The Committee, however, decided, notwithstanding the appeal of the Finance Committee for a larger sum, to let them have £5000, to allocate £1000 for special Coronation expenses, and to place the balance (nearly £6000) to the capital account. If all the clear profit were applied each year in the reduction of capital, the Corporation would be in a very good position for selling gas as cheaply as anyone. No reference to St. Helens would be complete without mention of the Glover-West vertical retort installation, which has played its part in what has been a most interesting and successful year's work. The retorts attract visitors from all parts of the world, who are all pleased to notice their smooth and easy working after the lapse of so long a period since their erection. This is something remarkable for a first setting of any new principle of vertical retorts. So satisfactory have they proved that more are to be put up. A personal matter must not be omitted. Reference was made by the Gas Committee to Mr. Glover's long connection with the St. Helens Gas-Works, first under a Company and subsequently under the Corporation. For twenty-five years he has occupied the position he now so ably fills; and the Committee recognized in his latest achievements the great value of his services, and expressed the hope that he would continue to serve them for many years to come.

Widnes Still Making History.

From a report of a meeting of the Widnes Town Council which appears on another page of to-day's issue, it will be gathered that the Gas Committee, with the able assistance of Mr. Isaac Carr, have once more succeeded in beating their own records in the matter of the price of gas. This is an achievement upon which the Committee and Mr. Carr are to be congratulated—as are also the gas consumers. More than ever may envious eyes be expected to be cast upon Widnes. And in truth the revised scale of charges is one in which those who are responsible for the management of the gas undertaking will take pride. To all ordinary consumers of gas for domestic

purposes, the price is to be 1s. 1d. per 1000 feet; while large consumers will pay 11d., and the charge to users of gas for motive power will be no more than 9d. per 1000 feet. The prepayment consumers, too, have not been forgotten in the bestowing of benefits; for henceforth they are to receive 54 cubic feet of gas in exchange for the penny which they place in their meter, as against 50 cubic feet before. In each of the other cases named, the reduction made is 1d. per 1000 cubic feet. These prices, the Chairman of the Committee claims, are absolutely the lowest ever put forward by an undertaking making gas from coal.

Glare and Illumination.

It was an exceedingly fair-minded paper on "Gas *v.* Electricity" that Mr. F. J. Hawkins, of Rugby, read before the Junior Institution of Engineers last Wednesday. He took neither the side of gas nor that of electricity; but, in a perfectly candid manner, he spoke of their relative virtues and the contrary, without any show of favour. It is rather an unusual thing to have a paper on gas and electricity without being able to trace in some way the leaning of the writer's preference to one or other of the illuminants. But Mr. Hawkins contrived to keep himself clear of any indication of the kind. There is one apothegmatical shaft in the paper that we hope will strike home in certain quarters. It is that "unfair criticism is detrimental to progress, and the lighting industry in general may suffer in consequence." Mr. Hawkins will not accuse us of unfair criticism by pointing out one of the lessons of his paper. Speaking of glare and intrinsic brilliancy, he shows the enormous difference there is in the intrinsic brilliancy of electric arc and metallic filament lamps on the one hand, and high-pressure gas-lamps and ordinary incandescent gas-lamps on the other. He points out how important is the question of glare; how important it is to eliminate it to a degree at which it is harmless; and how important to the pocket of the consumer are the means taken to reduce the intrinsic brilliancy to a point at which it can be tolerated from the physiological standpoint. It is not unfair to claim that, the intrinsic brilliancy per square centimetre of the incandescent mantle being so much less than that of arc and metallic filament lamps, there need not be so much loss to the consumer with the former as with the latter in dealing with the defect. There are other matters in the paper that may be noted in the lighting world as coming from a source of independent view. One is that, if there is complete combustion with a gas-burner, no trouble is experienced from a hygienic point of view. A second is that an important consideration is that the heat produced by a gas mantle conduces to good ventilation. A third point is that, at the present time, high-pressure gas lighting holds a strong position in the field of illumination. Mr. Hawkins knows these to be truisms; but how prone are some other people whom we have in our mind's eye to overlook them, or to repudiate them for very obscure and wholly unscientific reasons.

Engineering Training—A Conference.

The Institution of Civil Engineers are (as announced elsewhere) arranging a conference, to be held on June 28 and 29, to consider the course of education and training to enable our young men to become properly fitted for the engineering profession. The idea is a very practical one, and from it, it is hoped, good may come. But those with large experience in the training of youth can tell us that, no matter how much the seniors of the profession may define the track that training should take, that track, though it may be generally accepted as the correct one, may not be the best in all cases; and if education and training are to go by rule, and certain lines are made compulsory to attain desired ends, then it may have the effect of putting a bar to the progress of many a talented young man whose opportunities happen to be altogether out of harmony with the specified course. If training is to take specific and inflexible lines, in the directions indicated by the headings of the subjects down for discussion at the conference, one of the natural results would be to largely preserve the engineering profession for those who are fortunate to have money at their backs, and not necessarily any great weight of brains. We see in the long lines of the roll of members of the Institution the names of many who have made an indelible mark in the annals of engineering, but who were not tied to any inflexible line of training—in fact, not a few had to do a good deal of shifting for themselves in order to gain knowledge. There is just now a great deal of anxiety being manifested over the training of the coming engineer—perhaps (good as sound technical and practical training is) a little too much so. It may be that excessive strait-lacing in this matter may do an incalculable wrong to the future of the engineering profession, inasmuch as already—before the conference—a great deal more is exacted by rule and examination than in the past. If, for instance, the examinations—and they have been stiffened—that have been instituted by the Council fairly and fitly represent the standard of qualification for membership and associate membership of the Institution, then there are not a few who are members and associates whose names should be promptly ruled off the register. As a matter of fact, the Institution in the composition of its membership, is the most gloriously incongruous and inconsistent body of which we have knowledge. Think not that we are out of sympathy with the proposed conference, and its objects. We wish it and them every success. But in considering the details of education and training for the engineer, we hope the Committee will guard against laying down rules for guidance (which may come to be regarded as inviolable by many in authority in the profession) that ignore the important aspect of opportunity for all. Several names with large connection with the gas industry are mentioned as being on the Committee.

The Traducers of the Gaslight Company.

A big concern like the Gaslight and Coke Company with such immense commercial and other ramifications can hardly expect to be free from enemies and traducers; but the Company might claim from the latter that there should be a little spark of conscience and morality discoverable in the attacks so made upon them. "W. J. R." has been writing in "John Bull" on "How Gas Consumers are Robbed;" and we do not think we have ever seen so many untruths about the Company packed into so small a compass. It is stated that the price of gas North of the Thames stood for some time at 3s. 1d. per 1000 cubic feet; and then it was "gradually and grudgingly" lowered a penny at a time until at the end of 1910 it stood at 2s. 8d. What a pity the writer did not refer to the fact that, as we passed from 1910 to 1911, another 1d. was shed by the Company. Far from these reductions having been "grudgingly" made, the Company have, under the new *régime*, been working with might and main, and successfully, in order to get to lower prices. Then it is stated that the "Company supply a portion of South London where it has a rival, the South Metropolitan." The funny part about this is that the South Metropolitan Company have no power of supply in the portion of the area of South London served by the Gaslight and Coke Company; but "W. J. R." seems to think that competition is the cause of the price of gas being at 2s. 2d. in that area, whereas an Act of Parliament is the real cause. "W. J. R." apparently does not see how illogical he is in announcing the reductions in price that have been made successively as the business has allowed, and following up with an accusation as to a desire to plunder still more.

Councillors and Paid Offices.

An important departmental circular has just been issued by the Local Government Board to borough councils, urban district councils, and rural district councils. The matter dealt with is the question of the appointment to paid offices under the councils of persons who are, or have been, members of the councils. Representations on this subject have, it seems, been addressed to the Board from time to time; and they have been reminded of the rule made by the Registrar-General with regard to the office of registrar. The Royal Commission on the Poor Laws and Relief of Distress, they say, referred to this rule with approval, and have recommended that "a local authority should not be allowed to appoint an ex-member as a paid officer unless he, or she, has ceased to be a member of the local authority for a period of (say) twelve months before appointment." The Board signify their agreement with this view, and give expression to their confidence that councils generally recognize the impropriety of appointing to paid offices persons who are, or have recently been, members of their own body. They therefore think it necessary to intimate generally that in future, unless very special grounds are shown, they will not be prepared to sanction the appointment to any office, in respect of which their sanction may be requested, of any person who is, or has been within twelve months, a member of the council making the appointment. No doubt the Board are correct in their anticipation that this view will be generally agreed with.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 472.)

AGAIN the Stock Exchange has had a disappointing week. Business was quiet, and the tone was dull more often than not. In spite of factors which ordinarily would have been beneficent, Railways kept slipping down; and the American Market went heavily. It was account week; and, though perhaps not wholly devoid of difficulty, the settlement seems to have been satisfactory. The gilt-edged division was in good form, and Consols had a rise of $\frac{5}{8}$ for the week. The opening on Monday was not cheerful; affairs political and industrial, both at home and abroad, not being encouraging. Government issues were weak, Consols fell $\frac{3}{16}$, and Rails were quite flat. Tuesday was quiet, with irregular movements. Consols recovered; but Rails were flat. Wednesday's tone was more cheerful. Consols rose $\frac{3}{16}$, and Rails were better —a working arrangement with the 'buses being regarded as a strong point. Thursday opened brightly, more especially for choice lines, and Consols were in demand at an advance of $\frac{5}{16}$. Rails began by rising, then paused, then slipped back. Friday was weaker in several spots. Railways were sold down; but the gilt-edged division was strong. Saturday was quiet and rather dull. Rails were no better; and Americans were weaker. There was an abundant supply in the Money Market equal to all requirements. Discount rates were firmer. Business in the Gas Market was considerably quieter in the aggregate, although two or three undertakings had their full share of business. The general tendency was very good, and a large number of issues effected nice advances in price; the Suburban and Provincial Companies being conspicuous in this respect. In Gaslight and Coke, the ordinary was quieter, but immovably firm; all transactions being within the narrow limits of 105¾–106¼. The secured issues were little dealt in. The maximum realized 87, the preference from 102¼ to 103¼ (a rise of 1). and the debenture 81—a rise of ½. South Metropolitan was fairly active, and adhered closely to the range of 119½–120¾. In Commercials, the 4 per cent. was done at 114½ and 115½. Among the Suburban and Provincial group, Brentford old was dealt in at 257 free and 260 (a rise of 2), ditto new advanced 1, Brighton original marked 218½ (a rise of 2), Bournemoth preference 14$\frac{15}{16}$, Southampton 111½ and 111¾ *cum div.*, South Suburban preference 118½, and Tottenham "A" 148 (a rise of 6½). Hastings and St. Leonards, Ilford, and South Suburban debenture also advanced. On the local Exchanges, Newcastle changed hands at 102½ (a rise of ½), Liverpool "A" at 215, and ditto "B" at 164. In the Continental companies, Imperial made from 191 to 192½ *cum div.*, and 187½ *ex div.*, Union 95½, and European 19¼ free. Among the undertakings of the remoter world, Melbourne 4½ per cent. marked 100¾, Primitiva from 7⅞ to 8$\frac{1}{16}$, ditto preference from 5$\frac{15}{16}$ to 5$\frac{15}{32}$, and ditto debenture 98.

ELECTRICITY SUPPLY MEMORANDA.

Profound Electrical Thought on Ventilation—A Natural Order of Things Reversed for the Benefit of the Electrical Industry—Consumers for "Free Wiring"—Power Consumers and Electricity Costs.

THE "Electrical Times" has just been discoursing in a light and pleasant way, after the manner of the modern electrician, on the subject of ventilation. To bring ourselves to the same way of thinking as our contemporary, we have first to believe that the coming of electricity as a domestic agent for lighting and "heating" has entirely changed, in one respect, the natural order of things. Since the advent of electricity in dwelling-houses, our electrical mentors would have the world understand, heated air has ceased to rise, and it absolutely refuses to be expelled through the simplest of ventilating openings; since electricity has come, the gas-fire has gradually become incapable of creating an upward draught in a chimney; and since, too, electricity has come, the ordinary means of fresh-air ingress that have done duty for ages have ceased to perform this particular function. In these particulars, there has been a sort of physical revolution, for the sole benefit of the electrical industry, in order that there may be a sale of electricity for operating fans, which are stated by the Electricity Publicity Committee to be indispensable for tugging the contaminated air out of rooms, in which, of course, the Committee in question assume electric lighting and electric heating are employed. Nature is generous to have condescended to reverse her ancient doings for the advantage of a much harassed industry. However, we have this weighty pronouncement on the subject on the part of the "Electrical Times:" "The argument that gas improves ventilation is a fantastic conception engendered by too long an existence among the poisonous fumes emanating from gas-jets; and the only plausible reason which may be advanced for its employment is to fulfil the seeming obligation of the gas industry to provide us with innocent amusement." The compliment as to the provision of amusement may be reciprocated; for there is no more funny sight than to witness the awkward and grotesque attempts on the part of our electrical friends to try to convince people that a natural order of things has become so enervated that it cannot do without assistance from electricity. There is a little ambiguity about the quotation from our contemporary. Reference to "poisonous fumes" emanating from a gas-jet requires explanation. There has frequently been an attempt (unfortunately it has always been abortive) to get the press representatives of the electrical industry to tell us what are these "poisonous fumes" from a bunsen flame of which they speak so glibly. Perhaps we shall have more success this time when we ask the "Electrical Times" for the information, taking (say) a 2½ cubic feet (50-candle) or a 1¼ cubic feet (25-candle) domestic inverted gas-burner as the source of these "poisonous fumes."

We have started at the end of the singular argument in the "Electrical Times" on the subject of ventilation, instead of at the beginning. But to get to the opening lines. It is said that "the views of Dr. Bishop Harman, at a recent meeting of the Illuminating Engineering Society, on the question of the claims made for gas as a ventilating agent must finally settle any doubts as to the attitude of medical men." That is just what those views do not do. Medical men are fast displacing their former misconceptions as to gas lighting and heating; their increasing custom with gas companies is a sufficient proof. As to Dr. Harman's views, an article upon them appeared in the "JOURNAL" for March 21 last (p. 823); some points were submitted therein for Dr. Harman's consideration; and the article was at once brought to the notice of the Doctor. He has not replied. There are Dr. Toogood's experiments to be disposed of. The results which he brought forward in his article in the "Medical Magazine" can be verified at the Lewisham Infirmary as easily as his tests were made. Did Dr. Toogood tell the truth, or was he deliberately putting forward falsehoods? There is a question for our contemporary, Dr. Harman, or any other electrical partizan to answer. It must be borne in mind that the means of ventilation at the Lewisham Infirmary are of the simplest—merely plain exit openings at ceiling level. No large electrical fan is in use, such as is to be found in the meeting hall of the Institution of Elec trical Engineers—complaints of the "poor ventilation" of which hall (there is the authority of the "Electrical Times" for saying) were "heard on all sides" at a recent meeting, and it was "not a question of excessive heating, so much as of stagnant air, which is not being passed out of the building quickly enough." In the article now before us, we are next told that "the claims made for gas as a ventilating agent are of comparatively recent origin, and as yet no plausible evidence has been advanced to support them." Whoever the writer of the article is, we invite him to improve his knowledge. Long before the "Electrical Times" was born, a simple ventilating shaft and a gas-jet beneath were used for the ventilation of most public buildings.

Then we go on to read that "if there be a gas-flame" in a room, "it follows that such a room requires more ventilation than one lighted electrically." It does not at all follow. We are given to understand that an electrical fan is indispensable to keep a house healthy—that is to say, an electrically lighted house. With a simple ventilating outlet, the gas used for lighting in a room will do all that the electric fan will do without the fan installation cost, and the maintenance and running expenses. Therefore, it does not "follow" that, if there be a gas-flame in a room, the latter requires more ventilation than one lighted electrically. The boot is really on the other leg. That big fan in the lecture hall of the Institution of Electrical Engineers was apparently not sufficient to avoid the unhealthy air stagnation of which "Meteor" spoke after the meeting on Jan. 26. Our contemporary thinks it reduces the argument of the gas engineer to its logical conclusion by saying that he "asks us to have our room improperly ventilated all day that he may properly ventilate it for us at night." Not a bit of it. The argument of the gas engineer is that under simple, and, though simple, efficient, conditions of ventilation, the gas-burner during the hours for lighting renders greater aid than the electric lamp in keeping the atmosphere in a sanitary condition. What the electrical engineer recommends (*vide* Electricity Publicity Committee's literature) is that the means of ventilation shall day and night be mechanically controlled; the power being derived from the cables of local electricity suppliers. Such a suggestion has already excited "the derision" of many a householder. But beyond that, we surmise that an induction fan as well as an eduction fan is necessary for ventilation according to electrical notion, as the writer of the article in our contemporary evidently objects to air that enters under the doors, and carries with it the sweepings of the floors; likewise to air that enters through cracks in the windows, and dislodges and puts into active circulation in the room quantities of dust and bacteria. All the air is polluted. It is really terrible to contemplate. When we consider the thousands of cubic feet of air that pass through a room in a single hour, and multiply those thousands of cubic feet by the number of hours in the day, how enormously those bacteria in the cracks of the windows must multiply to keep up the supply for satisfying the theory of the "Electrical Times" authority on ventilation. And the dust! It is wonderful that we can see about a room for it; it is more wonderful still that we can see the carpet for dust; and above all it is marvellous that the writer of the article under comment is among us to add to the gaiety of life by narrating his thoughts and visions.

In order to make free wiring a success, it is very necessary that there should be a careful weighing of the prospects of the consumption of energy being of a character that will ensure the installation being remunerative. We are afraid that there is not any exquisite application of the requisite test before some undertakings indulge in free wiring, so as to reject that which may be held as speculative, and only to retain what may be fairly regarded as a

good investment. We have seen an amount of indiscriminate free wiring of new buildings that has turned out a very "bad egg" for those who have spent the money upon it solely with the view of, if possible, keeping out gas suppliers. No sensible landlord, however, will risk the letting of his houses by making it a condition of the tenancy that one form or other of illuminant shall be used. Most tenants of modern houses will have their gas-cooker and one or more gas-fires; and they do not care to be running accounts for both electricity and gas at the same time. They will not brook any dictating to as to what they shall or shall not use in the way of an illuminant in their houses. But it is acknowledged by those who are wise enough to make the admission, that business where free wiring is concerned must be selected, and not taken on indiscriminately. A communicated article in the "Electrical Review" insists on this as a *sine quâ non*. The writer states that "those who have adopted it [free wiring] without careful consideration of all the factors which enter into the question, have in many cases brought on themselves a great deal of trouble and expense, which could easily have been avoided had the proper policy been chosen and the system of work mapped out from the beginning." All that can be said is that such undertakings deserve the trouble and expense incurred for their unbusinesslike procedure.

But we see there are a good many factors that have to be taken into account; and these factors are immediate as well as distant, as, for instance, no present tenant can bind his successor in this matter. Free wiring does not by any means constitute a simple proposition. The first and obvious thing to be borne in mind, it is said, is that the installation that will use the greatest quantity of energy for the least expenditure of capital is the ideal subject for free wiring. We suppose that the least intelligent one among electricity station managers, whoever he may be, is not so dense that he cannot grasp a simple fact. Having got it well embedded in mind, he "will be very slow in accepting large houses or offices where early hours are kept." Those he is apparently advised to reject. But what is he to say to the occupants of these large houses and offices if he commences picking and choosing in this way? Station managers are counselled to receive with open arms "shops, especially those that keep open late, or have a poor supply of daylight." So we see that free wiring has its limitations from the profit-making point of view. We need not, however, worry very much about any speculative stupidity on the part of an electricity undertaking, as the greater the amount of dead-capital it has sunk in its business, so much the better for the competing gas undertaking. There is another point. Free wiring does not mean "free" everything, or in fact, anything for the consumer; for he has to pay a higher price than the normal for electricity if the rental for the misnamed "free-wiring" is included in the charge for current. There is great danger of unproductiveness in this course. Again, though the writer of the article before us says that the consumers under the free-wiring scheme like "to have the certain knowledge that there are no unknown liabilities to come on them from time to time," he cannot recommend that the charges should include lamps or shades. This is very sound advice, judging from the erratic character of the lives of metallic filament lamps in ordinary daily use. Though at the same time, when we hear of the boasts, spread abroad with megaphone-like noise, as to lives of 2000, 4000, 6000, and upward hours in the seclusion of the laboratory or in other guarded situations, it seems a pity to spoil the free-wiring "ship" for a mere 'apporth of tar. However, the writer warns that "the only safe method of dealing with fittings is to make the consumers either supply their own, or buy them outright from the supply authority. The free-wired installation should cease at the ceiling-rose, and the consumer should pay for all fittings and pendants, including the erection of the same." Then there is another thing the undertaking taking up this business is advised to insist upon, and it is that, "if the installation be damaged or destroyed by fire caused by other than electrical causes, the consumer must make good the cost of the damage." Such a provision it is thought will induce the hirer to include the installation in his fire-insurance policy "at a trifling cost to himself." There are not many occupiers of small, or cottage property, who trouble to insure their goods, so the advice would not apply in their case. Then a further recommendation is that the agreement should be binding on the consumer for a period of at least twelve months, and for such longer time as he remains tenant of the premises. Under all the circumstances, a householder will be well advised, if he has any preference for electric lighting, to wait until he can afford to put in his own installation, for he will be a happier man than under a free-wiring scheme such as is here propounded. Under it he is anything but free; even the wiring up to the ceiling-rose (if there is such a thing in the place) is not free. The consumer has to pay for it, either in the price of his current or by special rental. The scheme has been given a name to which it certainly has no title.

With a growing knowledge among manufacturers of the variety of means now open to them for securing their power supply, electricity distributors are here and there having the screw applied to them for further reductions in price, showing that power users do not find all the economy that electricians assert they can obtain by using the electric drive. The information is also circulating as to the cheapness of generating current on the spot where an installation is large enough and the load pretty constant for running a small private generating set by a gas or an oil engine. The Leeds Corporation Electricity Department have lately reduced their power prices to an extent that means the shedding of revenue to the amount of £2350 per annum. It appears (to quote the "Electrical Review") that "the revision is more of a necessity than a virtue, as one large firm alone who might withdraw if the prices remained unaltered would in that event deprive the department of a much larger sum." The lowest price that has been charged for power is 0·8d. per unit, less 5 per cent.; and the minimum is now to be reduced to 0·75d. The whole scale has come down—the prices ranging from 1½d. per unit for small consumptions per quarter to a minimum of 0·75d. per unit for consumptions of 400,000 units per quarter. Nothing is said as to the position of the lighting consumer.

NOTES FROM WESTMINSTER.

THE Swansea Gas Company and the Corporation did not succeed in composing their differences without going before a Committee; and so the Bill of the former supplies the principal gas item of the week. All other matters worth attention refer to water questions; and there are a few arrears in this line to be overtaken this week.

Swansea Opposition. It was a sharp fight that the Swansea Gas Company had last week with the Corporation, the Rural District Council, and certain property owners and occupiers, over the various proposals of their Bill. It is a measure of varied feature and interest; and the character of some of the contentions placed before the Duke of Wellington and his noble colleagues rather heightened the interest. Occasionally those present seemed to be in quite a breezy atmosphere. At one time of day, the decorous conditions of the Committee rooms of the Lords made them about the most uncomfortable of places in London to be in throughout a day. But the democratic spirit that is abroad seems to have invaded these rooms; and the austere stiffness of a past period has considerably declined. But this has nothing to do with the Swansea Gas Bill, other than that the change was particularly noticeable last week. As we look back over the proceedings on the Bill, the most striking thing about it is that the Corporation of Swansea should have been in opposition at all. Here is a Company, the Committee agreed, who are doing the best possible for Swansea, and who desire to meet the requirements of Swansea in the future in the most economical manner. It is clearly to their interest to do so. But the Corporation regard it as their duty to endeavour to place obstacles in the way of the Company accomplishing this desirable end; and they have not by any means come out of the trial as to whether they were right or wrong in a favourable light. The main question was as to land required for necessary works extensions. Some of the land the Corporation did not object to; other of the land they did object to for manufacturing purposes on account of the spoiling of the "amenities" of the district, and a bit of the land the Company require the Corporation have discovered they need for road widening. In fact, if the Corporation (perhaps they were ignorant of what they were actually fighting to achieve) could have obtained their way, they would have been doing the people of Swansea—gas consumers present, and gas consumers future—a great injustice. Mr. George T. Andrews (the Company's Engineer and Manager), Mr. H. E. Jones, Mr. Charles Carpenter, and Mr. W. R. Herring showed this; but against all the weight of evidence thus advanced stood Mr. E. H. Stevenson, the only gas engineer appearing for the Corporation, declaring that the Company could economically extend their manufacturing works on other lines. The judgment of the Lords was against him. The opposition relied principally on the question of nuisance from gas manufacture. We have not heard so much about gas-works' nuisances lately; but it was raised here. For occasions when it is raised in the future, Mr. Carpenter has supplied a very useful point. Less than ¾ mile from the Committee room in which their Lordships were assembled, he pointed out, there were gas-works with an output five times as large as that of the Swansea Gas Company. With a tidal river, there is a flow of air in either direction; and if these gas-works were a nuisance, people in the Houses of Parliament would experience it twice in twenty-four hours. The Swansea Company also proved their case for the capital they asked for. The sum is £200,000, with one-third borrowing powers, and the raising of the loan capital on the existing capital to the proportion of one-third—making in all close upon £290,000. On both the land and capital questions, the Corporation will probably oppose in the Commons. The proposal for a special purposes fund was struck out—the Committee apparently agreeing with the Corporation that, with the powers of reserve the Company already possess, the special purposes fund is not a necessity. The balance of carry-forward on revenue account, however, is to be confined to an amount equal to a year's dividend, and any excess is to be first devoted to freeing the reserve fund, and then to a reduction of the price of gas. There was an attempt to overthrow the stand-by clause in respect of persons having an electricity supply. This was unsuccessful; but the Committee desired that it should be made quite clear that the clause will only refer to cases where gas is used as a stand-by. Mr. Stevenson was understood to say that the stand-by clause has been declared by Parliament to be unjust; and that, if it has gone through, it has only been in cases of Unopposed Bills. It would be interesting if Mr. Stevenson would say how often the Private Bill authorities of both Houses have refused to allow stand-by clauses in Gas Bills in the past two

sessions, and how often they have allowed them to go through. The authorities two or three sessions since saw how illogical their attitude had been up to then, in refusing stand-by clauses to gas authorities, while they had been allowing them to electricity authorities for years. The clause giving the Company power to refuse a supply for purposes other than lighting in the case of any main insufficient for the purpose, or if and so long as such a supply would interfere with the sufficiency of supply for lighting, was extended by the addition of the words "or domestic use" after (in both instances) the word lighting. The power to provide suction-gas plant was allowed to stand.

Metropolitan Water. Coming to water questions, further mention must be made of the proceedings of the Joint Committee of both Houses on the Bills of the Metropolitan Water Board and of the Thames Conservancy. As was stated last week, the Water Board felt that they could not, in the interests of London, proceed with a Bill proposing a scheme that had been cut down by the Committee to nothing more than a mere shadow of its original form; and they had also resolved that they could not forego any part of their right to the abstraction from the Thames of 130 million gallons of water per day, on the terms suggested by the Committee in connection with the Conservancy Bill. When, however, the Committee met yesterday week, the Chairman (Lord Kintore) asked the Board not to take any precipitate step, but to have still more time for consideration. We cannot see that his point very much affects the question. He said that had the Committee passed the scheme in its original form, it would have kept the Board from Parliament for thirty and possibly forty or fifty years; while a reduced scheme would curtail that period. This may or may not be true. The Board have to provide for the future with a due regard to economy. The large scheme proposed would only have been carried out as required; but the ultimate economy largely depended upon the securing of the rights to materialize the project as planned by the Engineer. On behalf of the Board, Mr. Balfour Browne, K.C., agreed that the Board's final decision should be deferred until to-morrow.

Compensation. That inevitable question of compensation where water supplies and streams or rivers are jointly concerned was heard much of in connection with the Chesterfield Gas and Water Board Bill, when before Committee. Time indeed passes on rapid wing. It seems hardly possible that fifteen or sixteen years have elapsed since the Act incorporating the Chesterfield Board, and ending the old Gas and Water Company, was passed. But it is so; and now from occasional extensions and improvements in order to comply with the demands upon them for water, the Board have determined to carry out a large tripartite scheme, the construction of the sections succeeding, and not running on simultaneously, to meet the requirements of the town and district for many years to come. But the whole of the opposition was on the subject of compensation. Dukes, millowners, manufacturers, and traders put in appearance, all crying out for satisfaction in the way of water compensation. The Derby Corporation, as one of the partners in the Derwent Valley Water Board scheme, also opposed. By agreements with the Dukes of Devonshire and Rutland, and by acknowledging that millowners ought to be compensated for any damage (which could not possibly be substantial), the Chesterfield Board got their Bill through.

Repayment of Loans. There have been one or two instances of 25 per cent. reductions in the period desired for the repayment of water loans in connection with the Bills that have been before Committees the last week or two. The Gloucester Corporation in connection with their Bill had the experience of a reduction, which, of course, is no uncommon one; but there does not seem to be much system about the terms allowed. Gloucester are going to sink a new well and construct works in the neighbourhood of Ketford, near Malvern, at a total estimated cost of £26,690, including the purchase of land and easements. They therefore asked for a loan of £27,000, and for 60 years as the period for repayment. But the Committee who considered the Bill thought that 45 years would suffice. In the case of the Oystermouth Water Bill, the promoters only desired 40 years in which to repay the loan for new works; and the Committee cut it down to 30 years. In connection with water-works, the repayment period ought not to be cut too fine; and it would appear that promoters who request the longest period obtain in the end better terms than those who honestly ask for what they think is a fair and proper period.

Halifax and Loan Repayment. The question of repayment was also raised, before the Local Legislation Committee, in connection with the Halifax Corporation Bill. The discussion arose on a sum of £53,000 expended by the Corporation upon the construction of the Walshaw Dean reservoirs, and a second sum of £23,000 expended upon the completion of the reservoirs. The Local Government Board had suggested that, on the point of repayment, the Committee should take into consideration the fact that the money had already been spent, and that automatically a sinking fund ought to have been provided at the time when it was expended. On behalf of the Corporation, it was submitted that such a contention rather went to show that there ought to be a longer period given. What the Corporation asked was that the same time should be allowed for the repayment of the £53,000 as was granted for the rest of the loan. This they contended was only reasonable, because for the last ten years they had, on one loan or another, been paying into a sinking fund for the £300,000 expended on the reservoirs, from which they have not yet received a drop of water, nor are they likely to for some time to come. The Committee agreed to the suggestion that 45 years from the passing of the Act should be allowed for the repayment of the £53,000, and 50 years for the repayment of the £23,000. They also allowed 50 years for the repayment of the sum of £29,000, which comes in the same category as the £23,000.

Water Softening. The West Cheshire Water Company and the Wirral Water Company have Bills in Parliament this session; and they have been before a Committee sitting under the chairmanship of Sir D. Rose. The Bills are practically identical in character; and it is not difficult to see how close are the local ties between the two concerns. The West Cheshire Company are desiring various new powers. Like many other Water Companies, this one has been disturbed by the Frimley decision; certain works having been constructed by them in the full belief that they were acting legally. But the Frimley judgment put another complexion on the matter; and they are now asking Parliament to make the wrong right by confirming the works. The Committee have done what the Company desired in this respect; and they have given them further capital powers. But the whole of the controversy before the Committee turned on the question of the softening of the water. Many witnesses were called, and a mass of evidence was turned out, in connection with this matter. The water is obtained from Hooton and Prenton; and the Consulting Engineer (Mr. Isaac Carr) pointed out that the cost of installing softening plant at those places would be £20,000, and the annual cost of operating the plant would be about £2343 per annum. Sir James Dewar stated that there was an excessive amount of magnesia in the Hooton water, but much less in the Prenton water. The hardness of the Hooton water was nearly 24°; and of the Prenton, well over 16°. The Committee came to the conclusion that the Hooton water must be softened within eighteen months from May 1; the reduction to be to 10° of hardness. The Committee, while endeavouring to be judicial, were also sympathetic with the Company. They fully recognized that the decision might involve a temporary small reduction of dividend; but, on the other hand, they expressed the belief that softened water would increase the popularity of the Company, and they hoped that before long the revenue would materially increase. Concerning the Wirral Bill, the preamble was passed. But here again the Committee desired that unsoftened water from Hooton should not go into the Prenton reservoirs, and be distributed among the consumers in the Wirral Company's area. The Committee, in fact, required that the Company should be under the obligation put upon the West Cheshire Company.

Slough Water Purchase. It was thought when the Slough Water-Works Purchase Bill emerged from the Lords Committee duly amended, and all parties apparently satisfied, that the measure would pursue a merely formal course to the Royal Assent. But the Eton Rural Council were not satisfied with anything less than having the relations between themselves and the Slough Council strictly defined and set down in black and white. So they appeared before the Committee of the Commons to whom the Bill was referred. The Water Company had also a point that they required should be settled. This latter had reference to how the debenture stock should be dealt with. The Committee decided that the responsibility should be thrown upon the selling Company to pay off the debentures, and that the debenture holders should be properly protected. As to the more important of the points raised in the Eton Rural Council petition, the Committee determined that 1s. per 1000 gallons should be the maximum charge for water for public purposes; that one-tenth of the cost of the extension of mains should be borne by the Eton Council; while in regard to surplus profits, they decided that in any sum which might be appropriated for the purpose of the reduction of the rates, 15 per cent. should be applied to Eton and 85 per cent. to Slough. A provision empowering Eton to inspect the accounts was also inserted.

Costs of Opposition. An interesting point has cropped up in connection with the Chester Water Company's Bill. A note upon the proceedings when the measure was before the Earl of Camperdown's Committee appeared in the "JOURNAL" for April 4. In the course of the proceedings, it transpired that the Wrexham Rural District Council had made a contribution towards the costs of opposing the scheme; and his Lordship questioned the legality of so doing in view of the fact that the Council had not presented a hostile petition. The Rural District Council, in order to find out exactly where they stood in the matter, invited an expression of opinion on the point from the Local Government Board. The effect of the reply of the Board is that any payment of the kind should come before the District Auditor at the audit in the usual course; and should he take exception to the expenditure on legal grounds, but consider that it might equitably be allowed, it would be open for him to adjourn the audit so as to enable the application for the Board's sanction to be renewed. For the time being, therefore, the matter sits on the knees of the District Auditor.

Hull Corporation Bill. In relation to the water section of the Hull Corporation Bill, there has not been much in dispute. The Corporation desire to revive powers which have lapsed, in order to enable them to sink a well at Dunswell, and to supply water to Hedon, Withernsea, Hornsea, and South Holderness. Really the only question raised before a Committee

of the House of Lords was as to whether for the purpose of flushing and cleansing the water-mains, but not during the sinking of the well or the construction of works, the Corporation should be allowed to discharge water from the mains into the Beverley and Barmston main drainage, under arrangements similar to those to which the other Drainage Commissioners in the district have assented. The Beverley and Barmston Drainage Commissioners were antagonistic; and all the evidence of Mr. C. B. Newton, the Corporation Water Engineer, of Mr. F. J. Bancroft, his predecessor in office, and other engineers, failed to carry the point as against the Commissioners. The Committee refused to permit the discharge of any water from the Corporation mains into the Beverley drain, but passed the unopposed portions of the Bill relating to the extension of the limits of supply and new works.

PERSONAL.

The Council of the Illuminating Engineering Society have determined to have, in addition to a President, a Chairman to act in the absence of the President. As will be seen from the proceedings at the annual meeting, as reported elsewhere, their choice of first Chairman has fallen upon Mr. F. W. Goodenough.

Mr. Harold Barker, the Gas Engineer and Manager of the Buxton District Council, has been appointed Manager and Secretary of the Llanelly Gas Company, in succession to Mr. Thomas Acland, who relinquished the position on account of ill-health. Mr. Acland has for some time been associated with Welsh gas undertakings; and he was President of the Wales and Monmouthshire District Institution of Gas Engineers and Managers two years ago.

Mr. Lewis Mitchell, who was recently appointed as Water Engineer to the Corporation of Aberdeen, and who accepted the office, has written to Aberdeen withdrawing his acceptance—giving, as his reason, that it had been represented to him by the Corporation of Bolton, with whom he is at present engaged, that he had verbally undertaken to them to see completed the construction of a new reservoir which the Corporation are having made at a cost of £250,000. The Aberdeen Water Committee have agreed to accept the withdrawal, and to make a fresh appointment.

OBITUARY.

The "Journal für Gasbeleuchtung" reports the recent death of Dr. Otto Lueger, formerly Professor at the Technical College at Stuttgart. Deceased, who had attained the age of 68, was successively engaged at the water-works at Carlsruhe, Frankfort, and Freiburg; but in 1878 he commenced practice as a Consulting Water Engineer at Stuttgart, and was later made Professor, and given the honorary degree of Doctor of Engineering, at the Technical College. He was the author of a well-known work on the "Water Supply of Towns."

The recent death of Sir Nathan Bodington, who took a conspicuous part in all public affairs connected with education in Leeds, and who has left an enduring monument of himself in the University (which, in co-operation with the Marquis of Ripon, he built up from the Yorkshire College), calls for notice in the "Journal" from the fact that, as Vice-Chancellor of the University, he was one of the authorities of the institution who received Mr. James W. Helps and other representatives of the Livesey Memorial Fund when attending the conference on the subject of the proposed professorship held on the 7th of February last year. It appears that he went to Leeds originally as Professor of Greek, and, although his interests were mainly classical at the beginning, he threw himself whole-heartedly into the creation of a great technical University.

The Rothwell Fund.—Mr. L. F. Tooth, who is acting as the Treasurer to the fund being collected by the London and Southern District Junior Association in aid of the bereaved family of the late Mr. H. Rothwell, reminds us that the fund will be closed very shortly. Those who have not already sent in any sums which they may intend to contribute, should therefore do so without further delay.

London and Southern District Junior Gas Association.—At a meeting of the Association held at the Westminster Technical Institute last Friday, Mr. F. C. Briggs read a paper on "Carburetted Water Gas," and Mr. N. B. Hodgkin one on "The Distribution Department." The discussion on the papers was adjourned till the annual general meeting on the 26th inst. The time available does not permit of the inclusion of the papers in this issue; but abstracts of them will be published next week.

British Coal Trade in 1910.—A Board of Trade return just issued shows that the coal exports from the United Kingdom last year amounted to 62,085,476 tons, against 63,076,799 tons in 1909. The bunker coal shipped at home ports for use on foreign voyages was 19,525,735 tons last year against 19,713,907 tons the previous twelve months; that shipped for use on coastal voyages amounted to 2,436,681 tons, against 2,306,319 tons before. The quantity of coal shipped coastwise was 21,676,715 tons, against 21,239,882 tons in 1909.

TRAINING FOR THE ENGINEERING PROFESSION.

Conference Organized by the Institution of Civil Engineers.

We have received from the Secretary of the Institution of Civil Engineers (Dr. J. H. T. Tudsbery) a circular which is being issued to the members and to others interested in the course of education and training adapted to fit persons for the engineering profession, directing their attention to a conference which is to be held at the Institution on the 28th and 29th of June, to consider the subject. Dr. Tudsbery explains that the idea of the Council underlying the conference is that while the general principle embodied in the Institution bye-laws in regard to both education and practical training may be accepted as an expression of the view of the large body of engineers who compose the Institution, there remain still unsettled a number of questions bearing upon the details of preparation to meet these conditions. Experience has shown that difficulties arise in the stage of both general and scientific education, and perhaps especially in that of practical engineering training; and it is thought these may be met or overcome in some degree by discussion in detail of several questions which seem to lie at the root of these difficulties.

It is intended to introduce at the conference the following subjects:—

- The extent to which mathematical and scientific subjects should share with other subjects of literate education the attention of schoolboys who intend to enter later the engineering profession.
- The question of specialized entrance examinations for university or college courses of study in engineering science with a view to the curricula to be followed, and also of the inclusion in the latter of courses in modern languages.
- The relation of practical training to college study; whether, or to what extent, before, sandwiched, or after its conclusion.
- The position and uses of engineering laboratories in relation to education at college.
- The value of a university degree in engineering science in relation to professional competence.
- The requirements of practical training in works, with the necessary complement of scientific study.
- Practical training in workshops or on works of construction, with special reference to training in the engineer's office.
- The relation of engineering employers and colleges from the point of view of the practical training of college students.
- Workshop training as a preliminary to practical training in other branches of engineering.

The subjects will be introduced by means of short notes submitted by persons selected on account of their experience with, or the attention they are known to have given to, them.

The President of the conference will be Mr. Alexander Siemens, the President of the Institution; and the Presidents of Sections will be Mr. A. G. Lyster (General Education), Dr. W. C. Unwin (Scientific Training), and Mr. R. Elliott-Cooper (Practical Training). There is a very representative General Committee, among whom are the following: Sir Alexander Binnie and Sir Philip Magnus, Professors Bone, Burstall, Bertram Hopkinson, Smithells, and Silvanus Thompson, and Messrs. Edward Allen, W. B. Bryan, Charles Carpenter, Charles Hawksley, G. H. Hill, Charles Hunt, Walter Hunter, H. E. Jones, H. P. Maybury, J. G. Newbigging, C. H. Priestley, Henry Rofe, H. E. Stilgoe, A. P. Trotter, and Corbet Woodall.

The Papers for the Forthcoming Institution Meeting.

We have received from the Secretary of the Institution of Gas Engineers (Mr. Walter T. Dunn) the following list of the papers to be submitted to the members at the forthcoming meeting in Glasgow:—

- "Modernizing a Medium-Sized Undertaking," by Mr. C. F. Broadhead, of Middleton.
- "Some Aspects of Gas Supply in a South American City," by Mr. Bernard F. Browne, of London.
- "The Dessau Vertical Retorts at Sunderland," by Mr. Charles Dru Drury, of Sunderland.
- "The Choice of a Carbonizing System," by Mr. P. C. Holmes Hunt, of Melbourne.
- "Public Lighting," by Mr. S. B. Langlands, of Glasgow.
- "The Woodall-Duckham System of Vertical Retorts," by Mr. John P. Leather, of Burnley.
- "Notes on the Corrosion of Service-Pipes," by Mr. James M'Leod, of Greenock.
- "The Scientific Carbonization of Coal," by Mr. J. G. Newbigging, of Manchester.
- "The Uses of High-Pressure Gas for Industrial Heating Purposes," by Mr. E. W. Smith, M.Sc., of Birmingham.

In addition, there will be reports by the Carbonizing Committee and the Refractory Materials Committee; and the Gas-Heating Research Committee will present their third report. By permission of the Governors of the Glasgow and West of Scotland Technical College, the meeting will take place in the College Rooms—the entrance to the Hall being in Montrose Street, quite near to the Municipal Buildings in George Square.

THE LIGHTING AND POWER SUPPLY OF THE FESTIVAL OF EMPIRE EXHIBITION.

High-Pressure Lighting and Gas-Generated Electricity.

Photo. by Campbell-Gray, Festival of Empire Exhibition.

A VIEW, FROM THE UPPER TERRACE, OF THE KEITH HIGH-PRESSURE GAS-LIGHTING IN THE GROUNDS.

With regal ceremony, participated in by their Majesties the King and Queen and other members of the Royal Family, the great Festival of Empire Exhibition and Pageant of London were inaugurated at the Crystal Palace last Friday, under, in every way, brilliant circumstances—atmospherical, enthusiastic, and joyous—which, it is hoped, may be taken to augur a generous success during the entire course of the next six months. It is a festival primarily intended to knit tighter the bonds that exist between the Mother Country and the more distant parts of the great British Empire, and to assist in bringing the British nation into closer touch with Imperial interests, and to expand knowledge of the greatness of the aspirations and the work of our kinsmen, and of their magnificent progress, in the remote parts of the earth over which the British flag flies. They are of our flesh and blood; and we of theirs. But they realize our relationships and our affinities with deeper feeling and warmth, removed so far as they are from the Motherland, than possibly we do at home. They have spent their thousands of pounds in this unprecedented combination and display that is concentrated, with its unique gorgeous effects, on the fair undulating lands of the Crystal Palace. It is a mark of special royal favour and sympathy, and an honour to our colonies and dependencies beyond the seas, that their Majesties the King and Queen—the heads of our great Empire—should have singled out this Festival of Empire Exhibition, from all the events associated with this Coronation year, for their personal presence on its opening day, which is the best expression they could possibly give of their gracious wishes for an abundant success both materially and through those invisible, silent, and yet valuable, influences that spring from the cultivation of closer relationships.

It is not only a Festival of Empire, but it is a Festival of Light, in which gas plays the predominant part not only through the unparalleled display of light from hundreds of Keith high-pressure gas-lamps, but also through the myriads of electric lamps used for outlining buildings, and illuminating them internally, the electricity supply to which lamps is obtained from the power of mammoth gas-engines of the "National" type, which have been erected in the power house to be subsequently described in this article. The contract for all this work was obtained by the South Suburban Gas Company, in competition with the local Electricity Supply Company; and we cannot proceed with this description without giving due prominence to words of congratulation to the Chairman (Mr. Charles Hunt) and the Directors of the Company for their enterprise, to the Company's Engineer (Mr. S. Y. Shoubridge) on the completeness of his plans and their unalloyed success, and to the contractors—the chief of whom were the James Keith and Blackman Company, Limited, for the high-pressure gas-lamps, and the National Gas-Engine Company, for the splendid examples of vertical gas-engines which add to the already wealthy reputation of the firm for high efficiency and high-class workmanship.

Speaking of the general lighting of the grounds, of the northern end of the Palace and of the main entrance to the Palace, we have here—in our opinion, and that of many others—the finest public display that has ever been made of gas lighting in its advanced modern forms. Many exhibitions have been visited by us in this and other countries; and it can safely be said that the terraces and main avenues of the Crystal Palace grounds are more richly illuminated than has been any exhibition within the days of high-power lighting as we now know it.

In the evening of the opening day of the Exhibition, we walked through the Palace, and along the terraces that overlook the grounds. From here we gazed upon a scene of in this country matchless picturesqueness. High buildings and buildings small, of real architectural beauty in design, are seen set on the great lawns and amid trees in all their spring beauty, or flanking the newly gravelled avenues. The architectural features, the trees, the walks, the great bandstand, in fact all the many and varied details of the wonderful panoramic picture, are brought into strong relief in the night by the hundreds of high-power Keith inverted lamps that we have here, and that give an amazingly sparkling life to the scene. There is light, and plenty of it, everywhere. We walk along the broad terraces and avenues and in the bye-ways; and everywhere we find the lamps doing their duty with a lustre and consistency that give the gas industry every right to claim this as a Festival of Light and a demonstration of the empire of gas as a lighting agent. It must be seen to be realized; and in every mouth (save the mouth electrical) the verdict will be "Well done." The South Suburban Gas Company and their contractors have gained the encomiums that they intended to win.

The Compressing Plant and Piping of the Grounds.

We must not dwell too long on impressions and praise, as there is much to describe about this installation of high-pressure gas lighting. The drawings and photographs (for which we are chiefly indebted jointly to Mr. Shoubridge and the Keith and Blackman Company) will convey to our readers much information as to the position of the plant and the lamps and their general character, and will also be of considerable assistance to readers who pay the Palace a visit to witness this unique lighting and power display. The scheme is so extensive that the difficulty is to know where to start in describing it, in order to do it adequate justice. We will, however, venture to commence at the remote point in the grounds, known as the Penge entrance. A short distance from here, walking from this particular entrance, on the right-hand side of the central avenue is the main gas compressing plant. There are two sets of plant here, either one of which is capable of dealing with the whole of the lighting. The compressors are of the "F" size, each being capable of delivering 20,000 cubic feet of gas per hour at from 80 to 90 inches pressure. They are run by "National" gas-engines—the compressors being operated by means of a chain-drive. The engines have a good margin of power; and as their most efficient speed is somewhat higher than the speed of the compressors, the chain-drive makes an excellent arrangement, as not only does it enable the speed of the compressor to be corrected while getting the best out of the engine, but it also keeps the plant compact, and furnishes a quiet and safe method of driving. The compressors themselves are practically silent running; and the piping and bye-pass valves, &c., are so arranged that should either engine, by any means, be "pulled up," the other plant will take on full duty automatically. Under normal working, both plants are running, sharing the work equitably between them.

From this compressor station, the gas is distributed by 8-inch diameter cast-iron mains, diminishing to 6-inch, with branches of 4 inches diameter. The extent of the mains and pipes in the grounds is about 4½ miles, running through all the important avenues, and bye-ways—only the extremities of the football ground and the pageant ground being lighted by strings of electric lamps festooned from poles, and, in addition, in the latter case, by some flame arc lamps.

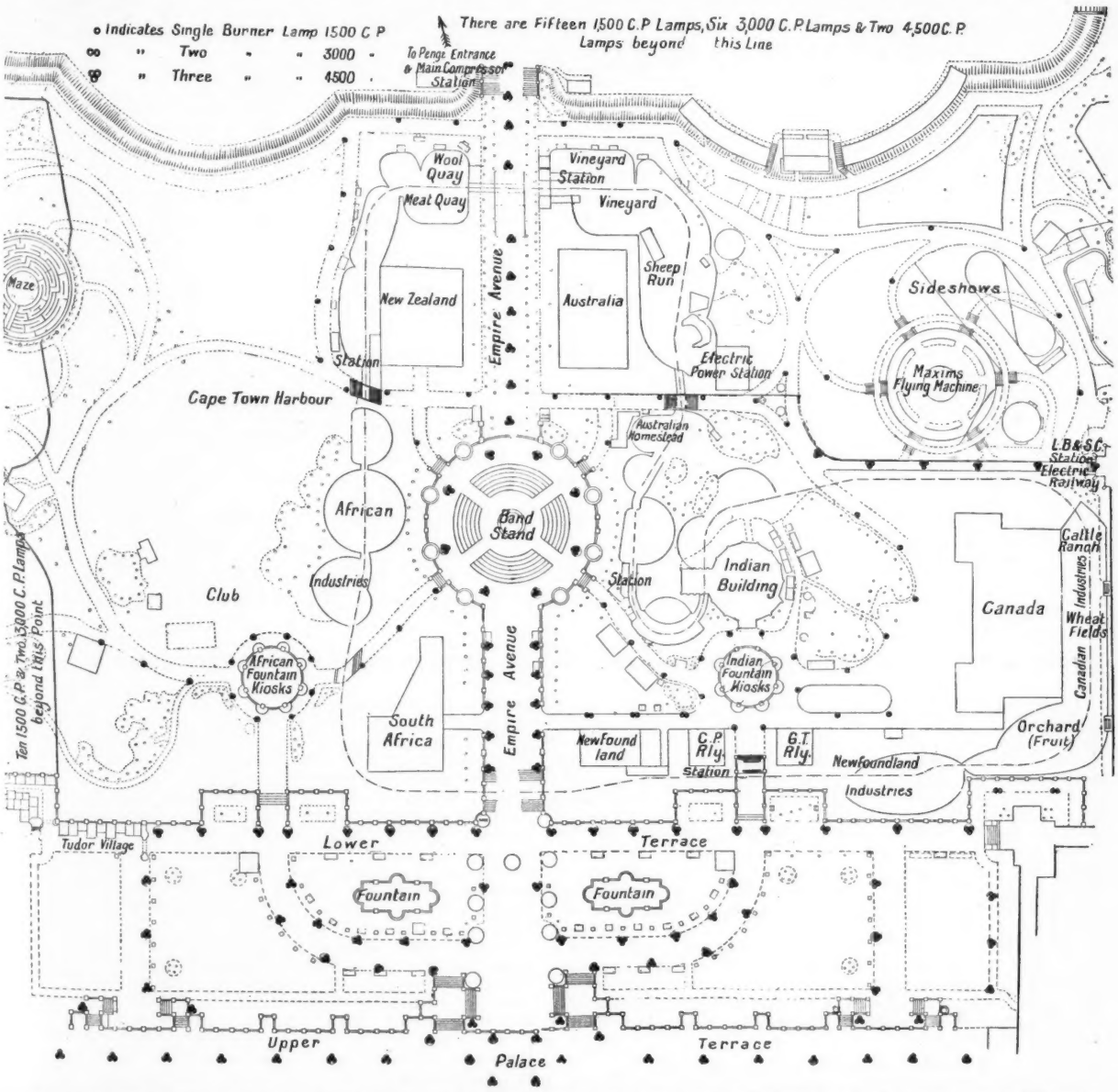
But there are interesting points about a secondary compressor station in the North Tower Gardens. In this building are fixed two Keith compressors, which are intended to deal with the

interior lighting of the northern half of the Palace when the main plant in the grounds is not in operation. One of the compressors is of Keith's "A" size, direct coupled to a ¾-horse power gas-engine, which can be brought into use, in the event of any dull day, for lighting some of the side-courts in the Palace itself, which are somewhat dark. The second machine is one of the "D" size, and is direct coupled to a "National" gas-engine. This is brought into use when the whole of the lighting of the interior of this half of the Palace is required prior to the exterior lamps being in lighting, as it is assumed that on most days the interior lighting will be required from half an hour to an hour before the exterior lighting. The whole of the lamps being on automatic lighters, this latter additional plant is necessary, as the high-pressure main, running from the Penge entrance, feeds the whole of the grounds, and the Palace itself, by a connection with the compressing plant in the Tower Gardens. It will be at once recognized that, if the main engines in the lower part of the grounds were put into use to compress the gas, the whole of the lamps in the grounds would light up; and unless there were the means of isolating the interior from the exterior, and of compressing the gas separately for the first period of lighting, to meet the requirements of the Palace, the lamps in the grounds would also have to be brought into use before they were wanted. When the main plant is put into action, and the lamps in the grounds are lighted up, then the plant in the Tower Gardens is closed-down, after the connection from the mains in the grounds to the interior piping is opened up. Taking a normal day, the method of lighting would be to start up the "D" size compressor in the Tower Gardens, and so light up the whole of the lamps in the interior of the Palace. Then, when required, the duplicated plant at the Penge entrance would be started, and the whole of the grounds would be lighted up. Thereupon, the connection between the exterior mains and the interior mains would be opened, and the "D" size compressor stopped—leaving the whole of the work to be done by the plant near the Penge entrance.

The Keith Inverted High-Power Lamps.

For the high-pressure lighting, the lamps adopted throughout are of the Keith inverted type; and let us say here that the lamps are of the standard pattern, and have not been made specially for exhibition display. They are the precise form of lamp that the Keith and Blackman Company supply under their ordinary trading conditions. The point is worth making, in order to disabuse the minds of our electrical friends of there being anything special about them. The lighting and extinguishing of all the lamps are arranged on the automatic principle—that is to say, by increasing the pressure from normal to the working pressure, the lamps are ignited; and, of course, the reverse takes place on reducing the pressure. This system, as readers are aware, demands the use of a continually burning pilot light; and, at the moment of increasing the pressure, there is a momentary long flashing flame that assures the ignition of the burners.

The main terraces of the grounds are lighted by lamps fitted with three burners, each lamp giving a total illuminating power of 4500 candles. The same candle-power lamps are installed in the Empire Avenue beyond the Central Band Stand. This is all lighting *par excellence*—in fact, there is not an unilluminated spot to be found anywhere. In other parts of the grounds, there are found two-burnered lamps of 3000-candle power, and in the smaller and less important side walks—including the avenue leading from the Penge entrance to the end of Empire Avenue (or the centre of the grounds), and the roadway leading from the Rockhills entrance to the Pageant Ground, there are 1500-candle power lamps. The positions of these lamps are all distinctively shown on the ground plan accompanying this article. But besides those so shown, there are five 4500-candle power lamps outside the main entrance of the Palace; and these throw a light along



PLAN OF THE MAIN PART OF THE CRYSTAL PALACE GROUNDS, SHOWING THE POSITIONS OF THE KEITH HIGH-PRESSURE LAMPS FOR THE FESTIVAL OF EMPIRE EXHIBITION.

Crystal Palace Parade that is the admiration of the people of the neighbourhood, who have never seen the front of Sydenham's Glass House illuminated with so much splendour before. There are also two lamps outside the Rockhills entrance, and two outside the Penge entrance.

The total number and types of high-pressure gas-lamps in the grounds and their aggregate candle power are as follows:

No. of Lamps.	C.P. per Lamp.	Total C.P.
97 ..	4500 ..	436,500
27 ..	3000 ..	81,000
93 ..	1500 ..	139,500
		657,000

The lamps are carried between two ornamental arms, extending from standards which bring the mantles, in the case of the 4500 and 3000 candle power lamps, to 20 feet from the ground level; and in the case of the 1500-candle power lamps, to 15 feet from the ground level.

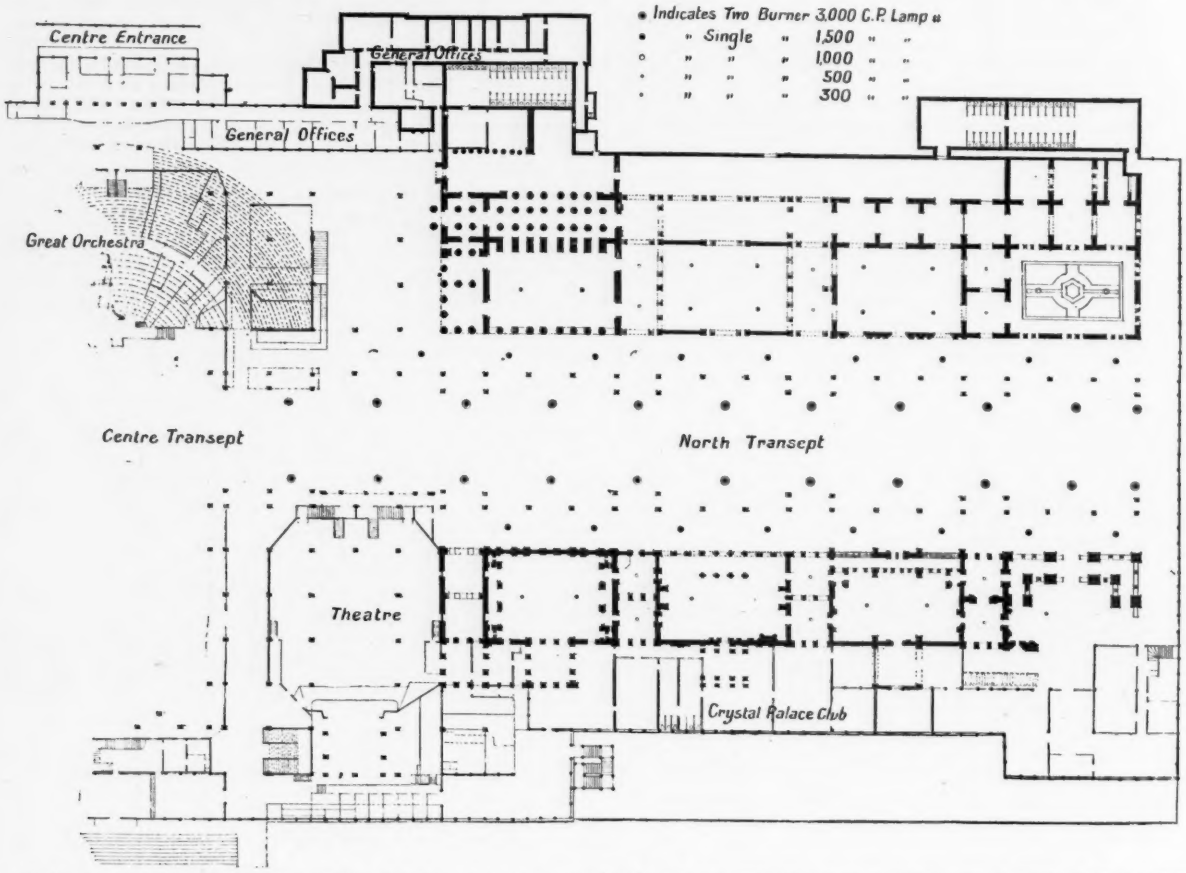
Before leaving the grounds, there is one interesting feature that may be noted. There is an artistic display of flame lights after the manner of the old Roman flambeau, on the centre and on eight points surrounding the roof of the centre bandstand, the flame being emitted from bowls carried on classical tripods. These "flares" are fed from the high-pressure gas system; the central one consuming about 100 cubic feet of gas per hour, and the eight smaller ones about 35 cubic feet each per hour.

In addition to the lighting of the Palace and grounds, all of Messrs. Lyons and Co.'s refreshment rooms in the grounds will be lighted by low-pressure gas with Messrs. W. Sugg and Co.'s three-burner inverted "Regent" lamps. The Terrace café is fitted with eighteen lamps, the New Zealand café with 25 lamps the Aero café with 18 lamps, and the "Popular" tea-rooms with 12 lamps. These places are brilliantly illuminated. In addition, gas is being used for cooking and hot-water supply in the cafés and tea rooms, as well as in the dining-rooms generally.

The Interior Lighting.

The North Nave of the Palace is brilliantly illuminated with 22 high-pressure 3000-candle power Keith inverted lamps; and in other positions in the side avenues and courts, there are 1500, 1000, 500, and 300 candle power lamps. To put them in tabulated form with the aggregate illuminating power, the figures are:

No. of Lamps.	C.P. per Lamp.	Aggregate C.P.
22 ..	3000 ..	66,000
18 ..	1500 ..	27,000
2 ..	1000 ..	2,000
18 ..	500 ..	9,000
12 ..	300 ..	3,600
		107,600



PLAN OF THE NORTH NAVE OF THE CRYSTAL PALACE, SHOWING THE POSITIONS OF THE KEITH HIGH-PRESSURE LAMPS.

In the North Nave proper, there are only 22 3000-candle power high-pressure gas-lamps; but the contrast with the flame arc lamps in the Centre Transept and the South Nave is strikingly in favour of the gas-lamps, though many arc lamps, with a "nominal" candle power of 4500 each, have been packed into the space, and, since the first portion of the lamps were installed, it is understood that comparison with the gas-lamps was so detrimental to the flame arc lighting that the carbons have been changed, in order to secure a whiter light. In the Centre Transept from the Organ to the Royal Box, there are thirty of these lamps; in the South Nave proper, 18; and in the Fair of Fashions, 8. Therefore in numbers that are in the direct line of vision looking lengthways of the Palace, the flame arc lamps are greatly in excess of the gas-lamps. Their reputed candle power is also enormously in excess. But the disinterested testimony of the public is that the North Nave is the better illuminated, and there is certainly more life about the lights, though softer and steadier. It is also well diffused; there being no dark nooks or corners to be found anywhere about the nave.

The Gas Company's Stand.

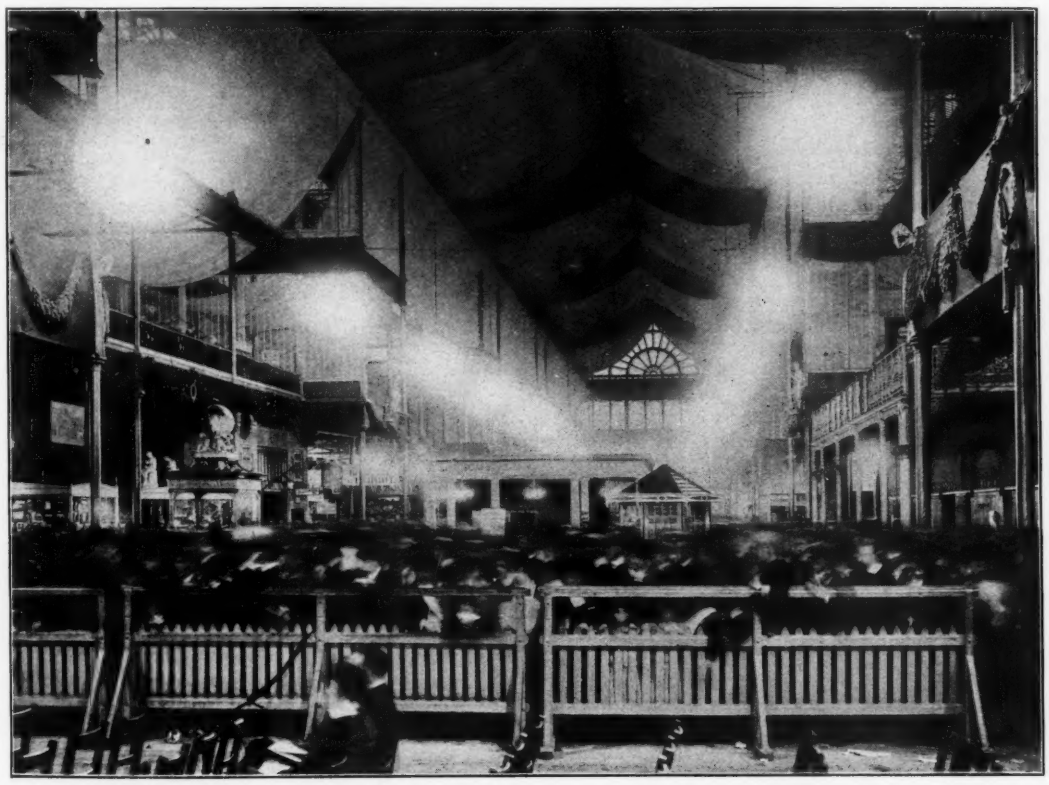
But the Gas Company have carried themselves as it were right into the competitor's camp. Under the light of the flame arc lamps in the South Nave, they have erected an artistic looking stand (24 ft. by 20 ft.), the design of which is due to Mr. Shoubridge. It is composed of a steel framework (made on the Company's works at Lower Sydenham), and surmounted by a large gilded crown. The framework is encased in bass wood, which polishes up like mahogany—this having been supplied by Messrs. Charles Spreckley and Co., of Gray's Inn Road. At each top corner of the stand there are fitted four of Sugg's three-burner inverted "Regent" lamps; and these make a splendid show. Mr. Shoubridge believes in active exhibits for attracting the public. At this stand, therefore, the Voelker Incandescent Mantle Company are exhibiting a knitting-machine in operation for making mantle fabrics, and they will also demonstrate the process of seasoning and shaping gas-mantles. Messrs. W. Sugg and Co. have also a man at work with a lathe spinning copper tops for their popular "Regent" lamps. On the stand are also demonstrated the conveniences of gas heating for the supply of hot water for domestic purposes—using one of Messrs. John Wright and Co.'s boilers. This is of the type that has an automatic arrangement for regulating the temperature of the water. When the water arrives at a pre-determined temperature, the gas supply is automatically shut off. When hot water is drawn off, and cold water flows in—the temperature of the water being thereby reduced—the gas is automatically put on again, and the temperature of the water contained in the boiler once more raised. The

arrangement is ingeniously operated—to attract the notice of the public—by a model of a hand which creeps out from beneath a curtain. There are also samples of fires, cookers, brackets and pendants, standard lamps, modern lamps, and dainty shades and glassware. The gas-fire, by Messrs. Fletcher, Russell, and Co., is fixed on a tiled hearth. The lights on the stand will be controlled by pneumatic lighters operated from switch-boards. The smaller industrial uses of gas, in the shape of gas irons and stoves, &c., are likewise being illustrated. It is an attractive looking stand; and, being not far from the Fair of Fashions, will be in one of the most direct paths of the thousands upon thousands of sightseers who will be drawn to the Palace during the next six months.

THE GAS-DRIVEN ELECTRIC GENERATING PLANT.

We must now turn from the lighting of the exhibition to the power-house, in which is generated the electric energy for the power and illumination requirements of the great display. No engineer will think of visiting the Palace during the run of the exhibition without going into the power-house, and inspecting the magnificent engines which have been specially constructed by the National Gas-Engine Company, Limited, of Ashton-under-Lyne, for the occasion, under their contract with the South Suburban Gas Company. The electrical equipment and auxiliary plant in the station both have their features of engineering interest.

Before describing the plant, a few words may be said about the power-house itself. It is easily located—being within a few minutes' walk of the Low-Level Station of the L.B. & S.C.R., and near to, on the one side, the Indian Village and Maxim's flying-machine, and on the other side near to the great representation of the Parliament House at Melbourne, Australia. The site of the power-house is really in a little valley; and it was chosen as being fairly central for the supply of electric energy to the railway and to the buildings for decorative and other illumination. It will be readily understood that the choice of position has its influence in the matter of the economical distribution of the current. In this respect it is a good site; but it was a fairly expensive one for the Gas Company, because it is on such a steep slope that it meant building the foundations to a considerable height at one end of the building, in order to bring them level with the opposite end. But there was some compensation in the fact that the soil was good; virgin soil being soon reached that had never been touched in the making of the Palace grounds. Only 2 or 3 feet beneath the surface a solid bed of London clay was reached; so that very secure foundations were obtained for the massive blocks of concrete that were to serve for the large gas-engines they were to support. The result is seen in the absolute rigidity of the whole structure. In confirmation, Mr. Shoubridge mentioned that in a test he had made with the electrician-in-charge, while the engines were running, they could not detect any tremor. The Directors of the South Suburban Company, under the advice of their Engineer, have done the work thoroughly well; and the Contractors have fulfilled their requirements to the letter, so far as inspection and observation enable us to judge at the present time. All engineers



[*Photo. by Campbell-Gray, Festival of Empire Exhibition.*

LAST SATURDAY EVENING—UNDER THE LIGHT OF THE HIGH-PRESSURE LAMPS IN THE NORTH NAVE.

who visit the building will, we are confident, applaud the work from beginning to end.

The building is a steel structure with steel roof. The walls are filled in with breeze concrete, with an integument of cement, supplemented by fibrous plaster ornaments, and painted outside to give it a stonelike appearance. The steelwork for the building and roof was supplied by Messrs. Edward Wood and Co., of Trafford Park, Manchester, to the designs of the Gas Company; and Messrs. F. De Jong and Co., Limited, of Camden Town, did all the fibrous plastering work. The internal dimensions of the building are 66 ft. by 50 ft.; and the height is 34 ft. 10 in. to the springing of the roof—this being 12 feet to the apex. The roof is covered with corrugated iron, to comply with the requirements of the Festival of Empire authorities for fireproof covering. There are two doors in front of the building, so that visitors can enter one side, circulate round the building, and leave by the other door. The flooring is of wood, to be covered with linoleum; so that in every way it will have a nice appearance, in keeping with the valuable plant it contains.

The "National" Gas-Engines, Driven by Town Gas.

The central features of the house are, of course, the three powerful vertical gas-engines, made and erected by the National Gas-Engine Company, Limited. They are splendid examples of the high-class work the Company turn out; and from the time they were set to work they have been running with charming regularity and smoothness. There are two of 1000 H.P. each, and one of 750 H.P., capable of working to a 10 per cent. overload; and we believe they are the largest in the country that are working on town gas. The concrete foundations for the two large engines are 31 ft. by 14 ft. by 9 ft. deep; and for the 750 H.P. engine, 27 ft. 6 in. by 13 ft. by 10 ft. As already mentioned, the engines are used for the generation of electric energy for both power and lighting.

There are many interesting details about these engines that have been picked up in conversation with the representatives of the Gas-Engine Company, which we may take this opportunity of putting into the possession of our readers who will be visiting the Palace, and will like to be primed on the technical distinctions of these examples of latter-day "National" design in large-power engines. Briefly, however, we may state as a preface that the 1000 H.P. engines have four cranks and eight cylinders, and the 750 H.P. one three cranks and six cylinders. Each engine is fitted with forced lubrication throughout, and double ignition; and all parts are interchangeable.

The engines, as already intimated, typify the latest designs of the National Gas-Engine Company. The Directors of the Company have been for some time looking out for a suitable design for large-power engines; inasmuch as they had not sufficient confidence in the double-acting water-cooled type to make them feel

justified in entering upon their manufacture. Their horizontal engine design, in which the power was limited to 150 H.P. per cylinder, and 300 H.P. per unit of two cylinders, was obviously not a suitable design to extend up to 1000 H.P.; and the solution of the difficulty lay in multiplying the cylinders, and adapting the plan to a suitable design which would take up less floor space, and give the higher speed the shortness of stroke ensures. Adopting these as the fundamental principles on which the new vertical type of engine should be constructed, there seemed to be a no more suitable design to follow than the vertical high-power steam-engine which has obtained so much success in this country. Taking as the basis a horizontal engine of 150 H.P. per crank, it is patent that one could not put seven cranks in a line to obtain 1000 H.P., and at the same time have a commercial engine as regards space. But if the cylinders could be arranged tandem, this would halve the number of cranks on the floor area. By this arrangement, the Company can get three times the power on to a given floor space that they are able to do with the horizontal engine. For instance, the superficial area occupied by one of these 1000 H.P. engines at the Crystal Palace is 21 ft. 6 in. by 12 ft. 9 in.

To proceed with the description, each line of cylinders has its own crank; the cylinders being disposed one on top of the other—the bottom piston being of the usual trunk type, complete with its crosshead pin. The cylinders are separate castings; the distance-piece or middle cover acting as a gland between the two pistons. The sequence of firing with these cylinders is so arranged that an impulse every down-stroke is obtained from either one or the other piston. This manifestly only necessitates a connecting-rod of the requisite strength to deal with the explosion from one cylinder. Here we have an important point. Taking a 1000-H.P. engine on the "Otto" cycle (upon which these engines are designed) running at 200 revolutions per minute, it is obvious that 800 impulses per minute will be obtained. The marvellously even-turning moment of the engine is due to this. On the other hand, taking a horizontal double-acting single-crank engine, with two cylinders, of 1000 H.P., this would run about 90 revolutions per minute, and would give four explosions in two revolutions, or 180 impulses per minute. In the case of a 1000 H.P. engine of the vertical type, the fly-wheel weighs 12 tons; whereas the fly-wheel on the horizontal double-acting engine referred to above would be nearer

[*Photo. by Borup, Streatham.*

NIGHT-TIME, IN THE NORTH NAVE, DURING THE CONSTRUCTION OF THE EXHIBITION STANDS.

40 tons in order to obtain the necessary degree of steadiness. The space between the underside of the top piston and the top side of the middle cover or distance-piece is utilized as a compressing space or buffer cylinder; the object being to balance the inertia of the parts on the down-stroke, as the buffer cylinder pressure is at its maximum when the explosion pressure is at the minimum. Balancing the inertia force on each line in this way accounts for the remarkable steadiness and freedom from wear on the bearings.

The metallic packing on the piston-rod is of cast iron, and is contained in a box in the middle cover; and it works on a cast-iron piston-rod, strengthened with a special steel bolt—connecting the top and bottom pistons together. This design was adopted because cast iron is by far the most suitable material to employ for this purpose in gas-engine construction. Especially is this so where coke-oven gas is used, owing to the sulphur present, which has a very detrimental effect on steel rods. All the reciprocating and revolving parts of the engines are treated with forced lubrication; the oil pressure being 20 lbs. per square inch. After passing through the bearings, &c., the oil returns to the bottom of the crank casing, and flows to the governor end, whence it is drawn by valveless pumps through filters, and is delivered into the main oil-pressure supply, to pass again through the bearings. It is interesting to note that the oil-filters can be cleaned out while the engine is running without the possibility of any dirty oil being pumped through into the main supply. The filters are in duplicate, and each one is sufficient in capacity to supply the engine. The act of withdrawing a filter causes a valve to close on the suction side of the pump. In the case of long runs, the oil is passed through an oil-cooler; the water on the way to the cylinders being the cooling medium. It might be mentioned that the bottom cylinders are lubricated from the surplus oil from the crosshead pin; the top cylinders and metallic packing being provided with a sight-feed pump worked mechanically from the engine.

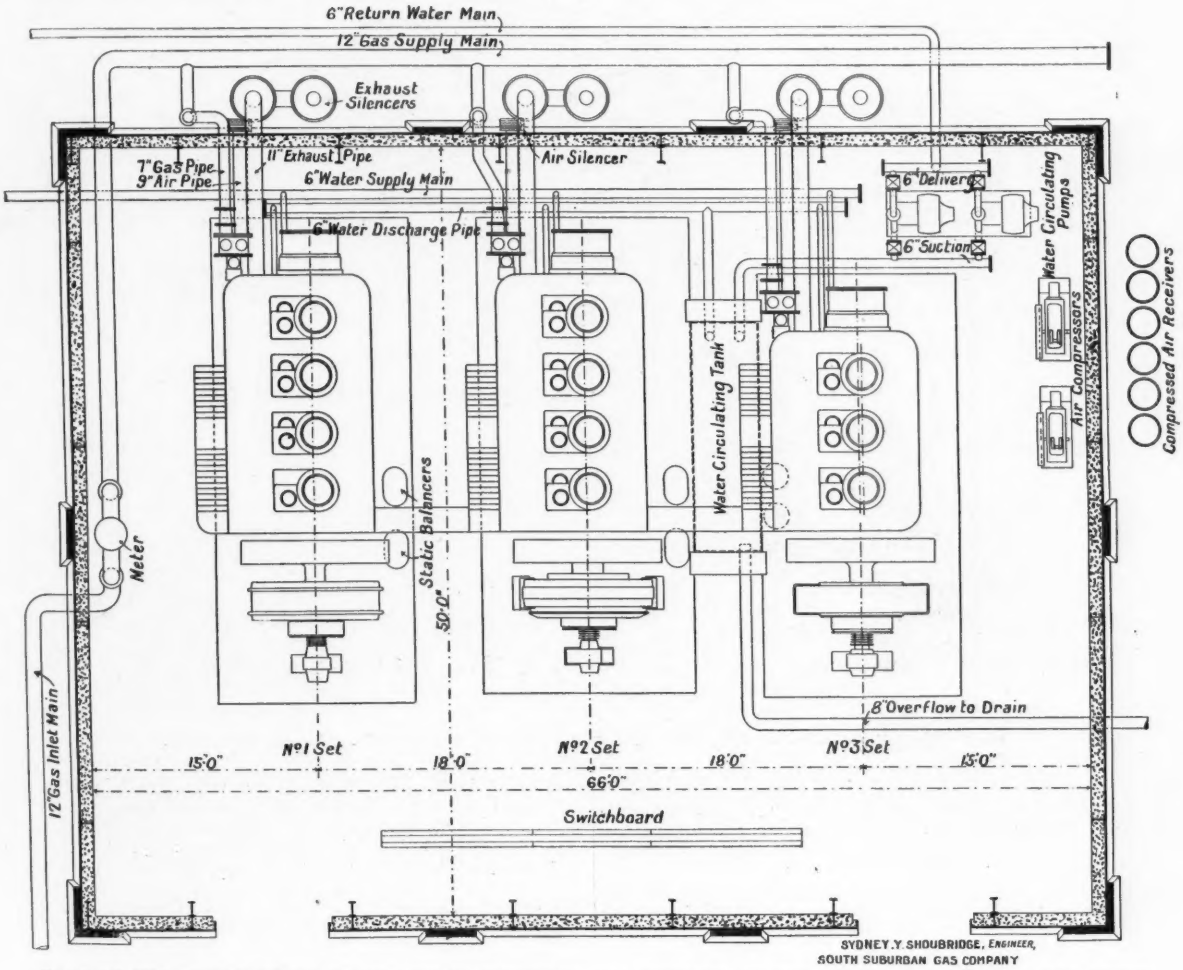
Owing to the special design of the pistons, the National Gas-Engine Company have been able to work these engines on town gas without experiencing the troubles that usually arise with gas-engines running on high-grade gas. The inlet and exhaust valves are of cast iron, working on renewable seats. Ignition is accomplished by means of magnetos in duplicate, driven from the cam

shaft—each magneto having its own plug in each cylinder, so that there are two sparking-plugs to each cylinder.

The governing is on the variable quantity system. The gas and air valves reduce or increase the opening in the respective pipes; thus giving either greater or less power. The throttle-valve is actuated by levers from the governor fixed on the end of the crank-shaft, away from the fly-wheel, and is contained in a neat casing, which is readily accessible. The speeder-gear is attached to this; and by its means the speed of the engine can be varied. while running. Should the speed increase more than 10 per cent. above the normal, a safety device is brought into action which automatically shuts off the supply of gas.

For starting-up purposes, compressed air, at about 250 lbs. pressure, is supplied from six storage-tanks or cylinders of sufficient capacity to meet the special conditions for which the engines are required. These cylinders are about 2 feet in diameter and 12 ft. 6 in. high, and are placed outside the building at one end. The compressor pumps air into the cylinders during the daytime to the 250 lbs. pressure named, and then it is available for starting the engines. The air-starting valves are grouped, with the gas, air, and water cocks, close beside the governor; and therefore it is not necessary for the attendant to ascend to the platforms in order to start the engine. The air-starting valves are also so arranged that when an explosion takes place, the compressed air is automatically shut off. We also learn that the Company find from experience that it is not necessary to provide half compression cams for starting-up purposes. All that is necessary in starting up is to turn on the compressed air, switch on the ignition, and adjust the gas and air valves; these operations being easily within the power of one man for the largest-sized engine. Although such giants, the gas-engines at the Crystal Palace, by these starting-up arrangements, are set running with a grace and absence of noise that will greatly please engineers.

One of the chief features of this design is the extreme accessibility of the parts. For instance, by taking out the connecting-rod bolts, slacking-back the oil and water connections, undoing the set-screws, keeping the middle head in position, and taking off the top cover, the whole of the line of parts—viz., connecting-rod, top and bottom pistons, and middle cover—can be withdrawn vertically. All the inlet-valve cages are within command of the crane; and large-size doors are also provided on the cylinder jackets, for cleaning-out purposes.



PLAN OF THE POWER-HOUSE OF THE SOUTH SUBURBAN GAS COMPANY AT THE FESTIVAL OF EMPIRE EXHIBITION.

In case the engine is ever required to drive electric generators—with either direct or alternate current—the coupling on the generator is bolted direct to a prepared face on the fly-wheel; thus dispensing with the usual flexible coupling. It may be mentioned, as a matter of interest, that in the case of a mill-drive, a rope pulley is installed; the rope grooves being turned on the periphery of the fly-wheel. For turning the engine round to starting position, and for putting the ropes on in the case of a mill-drive, a neat baring gear is embodied in the design of the frame, with an automatic throw-out gear to prevent accident, which would happen if the baring gear were left engaged.

Concerning economy, the Gas-Engine Company give the usual guarantee of 10,000 B.Th.U. per brake-horse-power per hour, although, as a rule, better results are obtained. The amount of water required for cooling purposes is 6 gallons per brake-horse-power per hour, if the water is run to waste. In a case where the water is cooled and used over and over again, make-up water to the extent of 5 per cent. of the total quantity used is required to be supplied.

In connection with this type of engine, an exhaust boiler is often installed, in order to utilize the heat from the waste gases, which, as a rule, is sufficient to evaporate 2½ lbs. of water per brake-horse-power of the main engine at full load.

Engine Silencers.

A silencer that makes a gas-engine really silent is a rarity. Here we have exceptionally good ones of very ingenious construction. The principle of them is expansion and contraction of the exhaust gases. The silencer is in the form of a vertical cylinder, and is fitted with suitable baffles. In this way the noise is reduced to a minimum—in fact, it is practically eliminated altogether. It is an excellent thing that this effective arrangement was available, as otherwise gas-engines of the size of those under notice would have been—well, hardly desirable at the Festival of Empire Exhibition.

Cooling Water.

For circulating the water for cooling the engines, rotary electrically-driven pumps have been installed in the power-house. These pumps are the work of the Rees Roturbo Manufacturing Company, Limited. The characteristic feature of the pump is that it is a true turbine pump—that is to say, the rotor has a strong "turbine" effect, due to the water passing. Hence the name "Roturbo." The turbine effect is secured by making the rotor of large capacity for storing water, which is maintained by rotation at a constant maximum internal pressure, independent of the external head, and by an ingenious application of the Venturi law

—transforming and extracting this pressure with the minimum amount of loss. Consequently, instead of throwing away the surplus speed energy of the water discharged when the head of delivery is reduced, the energy is extracted from the water before it leaves the pump-casing. These are cleverly designed pumps; and the principle is very interesting. Their working, too, is all that can be desired. The pumps are calculated to raise 16,000 gallons of water per hour to a height of 42 feet, at 1650 revolutions per minute.

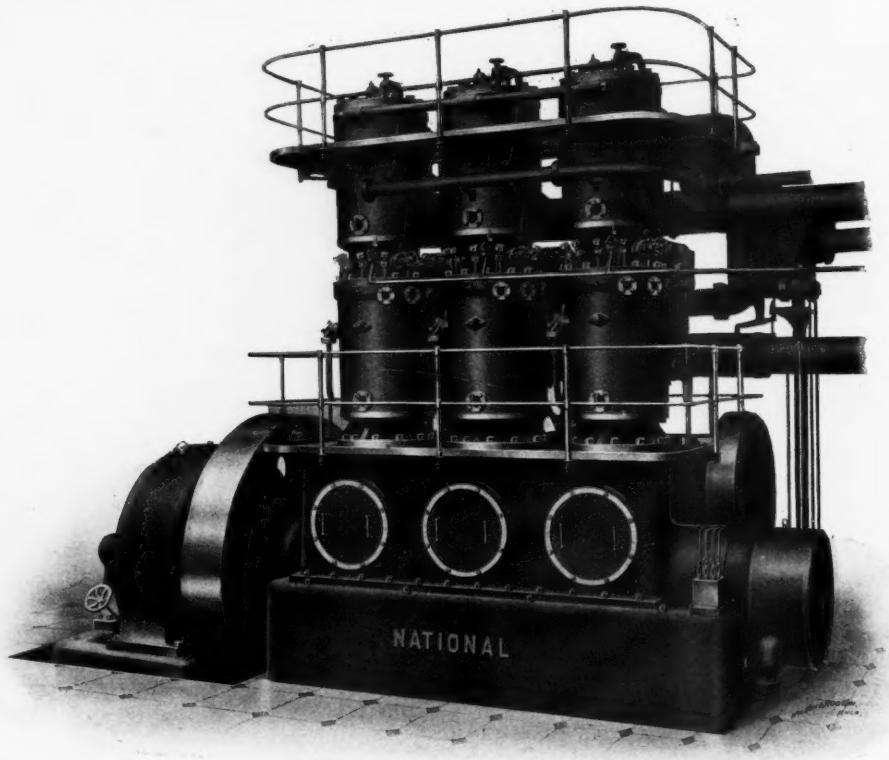
The water is obtained from one of the fountain basins about 180 yards from the power-house; the height being some 35 feet above the level of the engine-room. From this basin two pipes have been run—one being connected to the three gas-engines, and the other to the pump, as well as to a concrete tank, built between the engine-beds, to receive the water as it flows out of the engine cylinder jackets. The water, after cooling the cylinders, flows into a tank under the floor of the engine-house, whence it is picked up by the pump, and forced back into the fountain basin.

Gas Measurement.

The gas for the supply of the engines is all measured through a "Rotary" meter, capable of passing 50,000 cubic feet an hour.

Heavy Work.

Locally there has been a good deal of interest evoked over the installation of the gas-engines, on account of the great weight of their parts. The 1000 H.P. engines weigh 95 tons without the electric generators to which they are coupled; and the 750 H.P. one, 75 tons. The bed-plate of each of the 1000 H.P. engines weighs 18 tons, the crank-shaft 4 tons, and the fly-wheel 12 tons. These are ponderous castings to move about; and their size was as awkward as their weight was heavy. They had to be brought by road from the Marylebone Station of the Great Central Railway by motor and lorry. Their manipulation was very troublesome in the restricted area of the power-house; but it was managed with the greatest possible ease by the London Haulage Company, who are accustomed to moving heavy weights. Inside the house

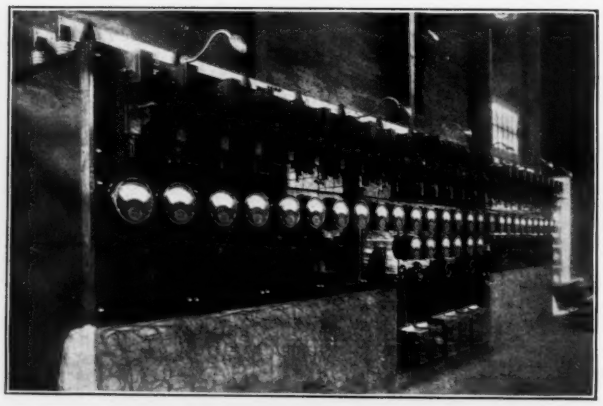


The "National" Vertical Gas-Engine specially Constructed for the Crystal Palace Lighting Installation.

they were assisted by a travelling crane, supplied by Messrs. Herbert Morris and Bastert, of Loughborough. This is a 7½-ton crane; it has a span of 48 ft. 9 in., and weighs about 6 tons.

The Electrical Plant.

The 1000 H.P. gas-engines are coupled up to dynamos made in the one case by the Lancashire Dynamo and Motor Company, and in the other by Messrs. Bruce Peebles and Co., Limited; while the dynamo attached to the 750 H.P. engine is of another make. The Lancashire dynamo is of the open, compound-wound interpolar type. The output is 450 volts, 750 kilowatts, 1670 amperes; and the speed 200 revolutions per minute continuous rating, with a maximum temperature rise not exceeding 70° Fahr. The efficiencies are stated to be as follows: 1¼ full load, 92 per cent.; full load, 93 per cent.; three-quarter load, 93 per cent.; and half load, 91 per cent. The generator is provided with four slip-rings, connected to suitable tappings on the armature. These slip-rings are attached to a four-phase static balancer of the oil-immersed type, which is capable of dealing with 300 amperes in the middle wire. The dynamo supplied by Messrs. Bruce Peebles and Co., Limited, is a 700-kilowatt generator. It is one of the firm's standard open type continuous-current dynamos, arranged to give an output of 700 kilowatts at 450 volts when running at the engine speed of 200 revolutions per minute. The machine is fitted with slip-rings, and is arranged for dealing with the out-of-balance current on a three-wire system. The generator is compound wound, and fitted with twelve main poles, in addition to twelve commutating poles; and it is arranged for running in parallel with the other machines.



The Three-Panel Electrical Switch-Board.

The switchboard is an imposing feature of the power-house. While it will be fully open (as all the other plant will be), every precaution will be taken, by railing off, to prevent the public inadvertently touching the plant. The switchboard, by Messrs. Bertram Thomas, of Manchester, is of their standard manufacture—being built up in three sections. The centre panels are arranged for the control of the three generators; these panels being of the three-wire pattern fitted with static balancers. Each pole of the generator is fitted with a Bertram Thomas reverse current circuit-breaker, and each pole is also fitted with a moving coil ammeter. On each of these generator panels, there is also fitted the field regulator of the dynamos, which stands on the floor behind the board, and is operated from the front of the board through bevel-gearing.

In addition to the above, each generator panel is also provided

with a single-pole switch, for disconnecting the static balancer from the mid-wire bar. On each side, extending each way from the generator panels, there are fitted five three-wire feeder panels; each circuit being fitted with a single-pole circuit-breaker on each pole, and a switch for connecting to the mid-wire bar. All the circuit-breakers mounted on the switchboard are of the firm's standard pattern, being of the magnetic blow-out type, and fitted with free handle. One very special feature about this switchboard is the extremely clear back, and full accessibility to all busbars and connections; and the self-evidence of the whole of the parts behind the switchboard. The whole of the busbars are carried along the top of the switchboard, and are well separated, consisting of bright aluminium bars. The whole of the back connections are also of aluminium bars, which are clamped to the busbars by specially strong clamps. For the equalizer switches in connection with these machines, it has been arranged that each machine has its own equalizer switch mounted on a separate pillar by the side of the machine, so as to reduce the length of cable in the equalizer circuit, and is so arranged for the most efficient equalizing.

Transformers.

The house is fitted with static transformers, so as to reduce the voltage of the current for lighting purposes. The transformers are placed in the building near the dynamos.

Lighting of the Building.

The house is lighted by four 1500-candle power Keith high-pressure gas-lamps suspended from the roof, and supplied from a separate compressor, in view of the fact that the house will require to be lighted after the gas-engines have ceased running. The place could not therefore be lighted electrically; and as the gas-compressing plant in the grounds will also at times not be running when lighting is needed in the power-house, it was considered advisable to make the lighting of the building altogether independent. Hence the separate plant.

Use of the Energy.

The electrical energy generated by means of these gas-driven dynamos will be used chiefly for the All Red Route Railway (which is about a mile in length), various side-shows, including the "Wait and See" Railway, and generally for the illumination of buildings. But the electricity is supplied by the Exhibition authorities; the South Suburban Gas Company's business in this connection ending with the power for generating the current.

We heartily congratulate the South Suburban Gas Company, their Engineer (Mr. Shoubridge), the National Gas-Engine Company, and the other Contractors, both upon the character of the work they have done in connection with the power-house, and upon the celerity shown in carrying it through in adequate time for trial runs being made before the opening of the Exhibition.

SULPHUR IN COAL GAS.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

In your issue for the 25th ult. (p. 228), an article by Mr. G. Stanley Cooper, B.Sc., on "The Elimination of Sulphur from Coal Gas," is prefaced by an assumption that, if allowed to pass unchallenged, may prove a source of serious injury to the gas industry at large. I refer to the statement, based on the findings of the London Gas Examiners, that in poorer provincial gas companies' districts the amount of sulphur runs up to 100 grains per 100 cubic feet of gas supplied. This assertion will not go unexploited by those who, from interested motives, are sparing no pains or ingenuity in the concoction of statements likely to create prejudice against gas among present or prospective users; and with this position in view, one might well look to the friends of gas to avoid any statement that cannot be supported by proof. The author is well aware of as much; for in the second paragraph he remarks: "Once a prejudice in this direction is set up among likely customers, it will take a good deal of work to remove it." It will take "a good deal of work" to remove the prejudice created by Mr. Cooper, to the effect that gas in some provincial towns may, and does, contain up to 100 grains of sulphur per 100 cubic feet.

An assumption is only excusable when more reliable evidence is not practicable or available; and this is especially the case when the magnitude of the interests involved is large. In the average provincial town, the gas is not officially tested for sulphur; and the subject attracts no attention. The consumer swallows his 100-grain dose (*vide* Mr. Cooper) in blissful and unconscious ignorance. Even if it is too much trouble to go round to half-a-dozen typical districts with a Referees' sulphur apparatus, it would be easy to find a dozen or more places where the gas-works laboratory equipment includes everything necessary, and tests are occasionally taken for the information of the engineer, or in the course of practice by his pupils. The actual facts are readily ascertainable, and therefore why jump at a conclusion?

The method of stating the sulphur as so many grains per 100 cubic feet is necessitated by its exceedingly small quantity stated as a percentage; and when used for scientific and technical purposes by people who appreciate the infinitesimal proportion so indicated, there is no objection. But the result is different when it is submitted to the man in the street, who knows nothing about the proportion existing between a grain and a cubic foot. He usually thinks in percentages; and the impression conveyed to his mind is that the gas is loaded with sulphur to the exclusion of other more suitable ingredients; that the 30 to 60 grains represent a substantial proportion; and he fails to appreciate the fact that, spread out over 25,000 grains of gas, the maximum quantity represents less than ¼ per cent., or that it is necessary to burn a gas-jet for several hours before one can collect a sufficient quantity of sulphur to make a fair determination.

The statement that the London Companies have a monopoly of the best talent and the best apparatus, and are the only ones that can "afford" to pay for purification and testing, is no correct presentation of facts. Subject to correction, I submit that the present position is that the London Companies are not applying any special treatment for the reduction of sulphur compounds, and that they are not doing anything which if left undone would run the sulphur up to 100 grains; also that the 30 to 60 grains do not represent the final result after some elaborate special process. I need not recapitulate the recent conclusions arrived at by a Parliamentary Commission. After full inquiry, it has been decided that the elimination of sulphur, other than sulphuretted hydrogen, is not worth the trouble.

No one will deny that, on account of sentimental reasons, it would be a good thing to make gas absolutely sulphur-free, or the possibility of doing so. But between possibility and practicability there is a long gap; and it is possible to pay too highly for sentiment. Gas engineers have no prejudice in the matter; and they would be only too pleased if Mr. Cooper or anyone else can outline any practicable process. But they do not attach too much importance to theoretical calculations that may or may not be correct. It is as easy to build an imposing house of cards on assumptions as to the amount of sulphuric acid given off by a gas flame, as to apply a like method to the quantity of "life-giving oxygen" destroyed, and such like claptrap so dear to those who trade on the nervous fears of the public. But gas engineers are practical men, and look for actual evidence. They have in view large and important districts supplied by municipal gas, where the sulphur clauses have never been applied, and where nobody is "one penny the worse."

At the worst, there is no reason why provincial gas should contain more sulphur than metropolitan; but I go farther than this, and claim that it contains appreciably less. Mr. Cooper appears to labour under the delusion that the purifying of gas, as at present conducted, is such an elaborate, complicated, and costly process that the full realization is confined to companies of the first magnitude; that the efficiency of the purifying plant is to be gauged by the magnitude of the capital investment; and that the advantage is in favour of the leading companies. This is altogether a mistake. The latest and best known methods of purifying gas are common property, and are as easily applied in the Provinces as in London. Mr. Cooper has also overlooked the question of quantity. It is very much easier to deal with a make of gas that can be expressed in five figures than with one that runs into eight. The methods adopted are much the same, whether on the large or the small scale; and the chief consideration is "contact-time" as between the gas and the purifying agent, as determined by dividing the cubical content of the vessels by the make of gas per hour. At any rate, there is no direct connection between them and the cost of the apparatus.

To get a fair comparison, select (say) an average 100 million works, take out the cubical content of the purifiers, scrubbers, washers, and condensers, and divide by the make of gas per 1000 cubic feet per hour; also take the sectional or surface area of each vessel. From these data it is possible to arrive at the velocity of the gas and the contact-time. For an illustration, take the purifiers, which will consist of four or six boxes not less than 20 feet square—in these days of cheap luteless purifiers, probably more. Six boxes, each 20 feet square and 5 feet deep, will give 12,000 cubic feet content; and the area of each box is 400 cubic feet, and the total thickness of purifying material 21 feet. The maximum make will be 2500 cubic feet per hour. So there is about 5 cubic feet area for every cubic foot of gas made per hour. The velocity of the gas through an empty purifier would be at the rate of 6¼ cubic feet per hour. But the purifying material would occupy (say) 75 per cent. of the space; so the velocity of the gas would be about 25 feet per hour, and the contact-time about 50 minutes. In a similar way, it is possible to calculate the cubical content and contact-time for a washer, scrubber, or condenser.

To get a similar result on a make of half-a-million cubic feet per hour, the total cubical contents and the horizontal area of the purifiers must be twenty times as large; and we get outside practical limits. The large make of gas must be dealt with by means of a greater number of vessels, giving a greater aggregate thickness of material to compensate for the increased velocity. So far from the large works being at an advantage as compared with the small ones, they are at a disadvantage; and there is no foundation for the suggestion that the gas is "better" purified at the large than at the small works. The small works not only have the advantage in respect to rate of velocity, but also as to temperature. I have often heard of gas at a large works getting round to the station meter at several degrees above atmospheric temperature; but at a small works it is practically reduced to atmospheric temperature at the outlet of the condenser. As there appears to be evidence that these sulphur compounds, or some of them, exist as very volatile liquids, the slow contact-time and the lower temperature in the scrubber and washer are more favourable conditions

for their reduction and removal. Longer contact-time in the dry boxes, perhaps, may not affect them, but the alkaline sulphide in the weak ammoniacal liquor decidedly effects their reduction.

The Salisbury Gas Company are not under sulphur clauses, and the purifying plant presents no distinctive features that are not to be found in works of similar size. They are not an exception in having apparatus of ample size, because it is a matter of quite common knowledge that the best working results are obtained from large plant; and it is much more usual to find a generous provision for the possibilities of the future, than apparatus so small as to imperil the efficiency of the purification. During the last twenty years, upwards of a hundred tests of sulphur compounds have been taken with the Referees' apparatus. The average result is 15 grains per 100 cubic feet, the maximum under 20. I would therefore submit that this figure is nearer the truth than Mr. Cooper's 100 grains. I hope information of a similar character may be forthcoming from other small works.

In referring to the use of clay as a means of reducing the sulphur compounds, Mr. Cooper does not mention that the Rev. W. R. Bowditch put it into practical operation in 1854 (*vide* "Bowditch on Coal Gas," p. 24), and claimed that after eleven years' experience the process was not only costless but a source of revenue (see p. 26). The clay could be purchased at 2s. or 3s. per ton; and the spent material sold readily at 21s. a ton, at which price there was no manure in the market that could compete with it. From this it would appear that the gas gave up not only sulphur but a considerable quantity of ammonia to the clay. It would be interesting to know why, after eleven years' use, this lucrative process was allowed to drop out of sight. That it was not altogether a success is evident from the fact that Bowditch, later on, expresses a preference for heated lime, and mentions (p. 33) that "purifiers for domestic use at the outlet of the meter are made and sold as articles of commerce, so that anyone who pleases may remove sulphur from the gas."

I would also mention that in a residential country district the public are more sensitive to sulphur in the gas than in large towns, where they are used to the presence of a quantity given off by other sources, such as smoke from domestic and factory chimneys; and that if, in such a district, gas containing more than 40 grains of sulphur per 100 cubic feet was supplied, complaint would be received at the works.

Replacing a Section of Submerged Pipe.

A broken 30-inch cast-iron water-pipe under 26 feet of water and 4 feet of mud was recently replaced by the Bridgeport Hydraulic Company, of Bridgeport (Conn.). The following particulars of the operation were given in "Engineering Record:" An internal examination was made after pumping the pipe clear of water, and keeping it clear long enough to satisfy those in charge that it would be safe to send a man inside. The pipe was found to be broken beyond repair; four large cracks leading from a bruised spot where the pipe had received a powerful blow from the outside. The pipe-line was originally laid in sections of four pieces; making 48 feet of pipe handled at one time. Three joints of each section were bell and spigot, made up above water; the fourth, made below water, was a bolted flange joint with a 1-inch round gasket partially embedded in a groove between the flanges. It was this gasket in the groove that prevented the broken piece being removed intact. Bolts were removed from the flanged joints at each end, and the broken piece reduced to fragments by dropping a 2000-lb. pile driver hammer upon it. The three sound pieces were brought to the surface, one bell end was cut off, and a new piece was provided with a sleeve leaded upon the spigot end. Repairs were completed by replacing the four pieces and sleeve in the pipe-line, bolting the two flange joints, and making up a cold lead joint in the sleeve under water—an easy job on land, but a decidedly hard one under water and mud. Only once did the diver see the pipe under water; all his work had to be guided by the sense of feeling through a pair of mittens. The entire job was completed in 21 hours with one diver working. The pumping was done with a No. 6 "Pulsometer" pump.

The "Co-Partnership Journal" of the South Metropolitan Gas Company for the current month opens with a sketch by the new Director, Mr. Frank H. Jones, of his life-work as an engineer; and his portrait is given as a frontispiece. He says he made his first acquaintance with South London in the year 1892, when, as pupil of Sir John Wolfe-Barry, he was sent on to the railway then being constructed to connect Shortlands and Nunhead; some portions of the line being in the area supplied by the Company of which he is now a Director. In a short time, he was transferred to the Tower Bridge, of which Sir John was the Engineer, and of which he gives some particulars. Referring to the co-partnership scheme, he points out how much the movement owes to the originator of the idea, and to the loyalty and good spirit in which it has been carried out by the employees of the Company. He remarks that while it is a great privilege to them to belong to the premier and most successful co-partnership scheme, it puts upon them all the obligation of "keeping it in the future in its present foremost position, as an example for others to follow." The Editor (Mr. Walter T. Layton) continues his "Biographical By-paths"—dealing with the dawn of the Company's prosperity, and giving portraits of Mr. Thomas, Mr. (afterwards Sir) George, and Mr. Frank Livesey.

INCANDESCENT GAS LIGHTING IN TRAINS.

Figures are given in the April issue of the "Revue Technique et Industrielle" showing the number of railway locomotives and carriages in different countries of the world lighted by incandescent gas, and showing the large increase in this respect between April, 1908, and December, 1910. In view of recent railway (and other) accidents, these figures are eloquent as indicating the safety, popularity, and convenience of incandescent gas lighting on railways. Without attempting to give all the figures, we select the following:—

	No. of Locomotives and Carriages.		
	1908.		1910.
England	20,459	..	47,174
Germany	60,804	..	68,862
France	11,914	..	15,889
Holland	3,983	..	4,077
Austria	6,465	..	7,115
Russia	4,757	..	5,386
United States	31,392	..	33,786
Canada	1,626	..	1,885
Argentina	1,675	..	1,798
India	12,831	..	14,473
Australia	2,945	..	3,127

The statistics given indicate that, whereas in April, 1908, there were 164,432 railway vehicles lighted by gas, less than two years later there were 210,184 gas-lighted carriages—being an increase of 45,752.

It is stated that the universal experience of railway companies is that incandescent gas gives a better and more constant light than electricity, at half cost, and with less expense in first cost and upkeep. This is shown by the following comparison:

Carriage equipment for electricity	4200	to 4500	francs.
,, ,, ,, gas	700	to 2000	,,
Annual maintenance for electricity	400	to 450	,,
,, ,, ,, gas	50	to 100	,,

HIGH-PRESSURE GAS.

M. Payet, who, it will be remembered, was for some time the Secretary of the French Gas Society, has contributed to the "Revue Technique et Industrielle" (an excellently arranged French monthly now dealing exclusively with gas lighting, heating, and power) an article on the above subject, the importance of which is ever-growing, and the ultimate effect of which, though at present not clearly seen, may be of wide-reaching results. We merely summarize here some portions of M. Payet's article.

The idea of high-pressure gas conjures up, he says, a vision of extended usefulness for gas—not merely by increasing the efficiency of present apparatus, but by augmenting the power of existing mains and by enlarging the scope of gas-works. On the Continent, the installation of Sainte-Marguerite, near Lake Constance, in 1903, serves as a starting point; being followed in Germany by more than forty such installations, carrying illuminating gas to great distances. The earliest was the supply to the port of Travemünde from the Lübeck works, a distance of 23 kilometres (about 14 miles); and the latest, the construction of a central station at Bismarckschütte for a length of 60 kilometres (37 miles). In Belgium, more than 200 kilometres (124 miles) of high-pressure mains have been laid; while in France, though the system has not been adopted so extensively, there are several typical installations. Among others may be named those at Triel, at Thonon, the supply from the Gennevilliers works of Boulogne-sur-Seine and Alfortville, over 18 and 33 kilometres (11 and 21 miles) respectively, at Lyons (for the neighbouring communes of Neuville, Rochetaillée, and Fontaines), and at the Landy works for direct supply to Paris. The future will, M. Payet says, probably see an extension of this movement, brought about by the excessively low prices imposed on gas companies when renewing their local lighting concessions.

The author then shortly considers the simple mathematical aspects of high-pressure supply and the motive power necessary. The cost at Barmen (Germany), which dates from the spring of last year, and which from its Hamborn works supplies 50 kilometres (31 miles) of high-pressure main, amounts to 1·25 frs. per cubic metre of gas, including interest on capital, sinking fund, and general maintenance. The coke-oven gas supplies of the colliery districts of Ruhr, the Sarre, and Silesia are named, and their extension anticipated. The conditions on the French side of the Rhine are different; but it is not Utopian to consider a similar movement in the coal fields of France, when it is remembered that there are 36,000 communes of which hardly 1500 have a central distribution of gas for lighting and heating.

Apparatus for the application of high-pressure gas is referred to; and an arrangement, on the consumer's side of the meter, is illustrated to allow the mixing of ordinary gas with high-pressure gas or air for increasing the efficiency of the burners. It is stated that, at the present prices in Paris for gas and electricity, lighting by high-pressure gas would show a gross saving of at least 70 per cent. over that by electricity. High-pressure gas allows of the practical adoption of powerful intensive burners, comparable to the high-power electric lamps in use; and these two competitive agents can go on progressively towards the perfecting of the lighting industry.

UNITED MEETING OF THE ENGLISH JUNIOR GAS ASSOCIATIONS.

A Busy Day in Birmingham.

WITH members of the English Junior Gas Associations scattered as they are all over the country, the arrangement of a joint meeting is a big affair, and one that cannot be entertained too frequently. Such gatherings, however, when they do take place, are useful in bringing the members of the different Associations into closer touch with one another than could otherwise be the case—quite apart from any consideration of what may be the day's programme. Last Saturday was the date decided upon for the third of the meetings of this character. The first was in 1907, when a visit was paid to Manchester during the time of the gas exhibition there; the second, in 1908, was held at the Franco-British Exhibition in London; and the one which forms the subject of the present notice took place in Birmingham.

Crammed full as the city is with industries of all kinds, both large and small, there must be something to interest nearly everybody in Birmingham; but for the gas man there is a very great deal. In addition to the huge gas manufacturing stations, there are large works where gas appliances are made; and last, but not least, there are the important developments in connection with high-pressure gas. With so much material at hand, it is no wonder that an attractive programme was prepared. So full, indeed, was it that no one could hope to take part in all the items; each member being given the opportunity of choosing those visits at which he would prefer to be present. The arrangements were in the hands of the following Committee: Messrs. J. H. Brown, H. E. Copp, R. S. Hilton, and C. Meiklejohn, representing the Midland Association of Gas Managers; and Messrs. P. C. Balcon, J. Hewett, W. H. Johns, R. S. Ramsden, R. J. Rogers, and G. C. Pearson (who acted as Hon. Secretary), of the Midland Junior Gas Association. It is to be regretted that more members of the different Junior Associations did not see their way to be present; but when consideration is given to the difficulties under which juniors must necessarily rest in a matter of this kind, it is realized that it would be unfair to argue that non-attendance denoted lack of interest in the movement. This, in fact, was emphasized, in the course of some remarks he made at the tea, by Mr. A. L. Holton, the Secretary of the United Councils of the Junior Associations. Those who did take part in the proceedings, it will be gathered from the following account, had a thoroughly good time.

The Morning Visits.

The different parties, on arrival in Birmingham, were met at the station by members of the Arrangements Committee; and a start was immediately made with the day's programme. A series of four visits were set down for the morning. That is to say, there was the choice of inspecting the works of (1) Messrs. John Wright and Co.; (2) the Birmingham Aluminium Casting Company, and the Bell Barn Road works of Messrs. Parkinson and W. & B. Cowan; or (3) the Wolseley Motor Works.

No more than a hurried inspection was possible for those members who journeyed to Thimble Mill Lane to see the works of Messrs. John Wright and Co., though Mr. H. James Yates, the Managing-Director, and various members of his staff, did everything possible in the time at disposal to show the magnitude and character of the operations carried on. Some idea of the former will be gathered from the fact that the works cover 20 acres. At the present moment another big store for gas-fires is being built; and when this is finished, the firm's accommodation for storing and packing goods will be represented by floor space three-quarters of a mile in length. The gas-stove foundry occupies 5 acres; and in the machine shop there is an astonishing amount of machinery, all of the firm's own designing. There is an extensive enamelling works, where Mond gas is utilized. Daily analyses are taken of the different materials used on the works; and at the present time there are six men occupied in research work. The firm are extending their laboratories very much, and building large works to be devoted entirely to furnaces of all descriptions for different industrial uses. Great interest was evinced in the laboratories, where Mr. Yates's remarks were closely followed.

Before leaving, a hearty vote of thanks was passed to Mr. Yates and his staff, on the proposition of Mr. R. S. Ramsden, seconded by Mr. W. Cranfield; and Mr. Yates briefly acknowledged it.

At Messrs. Parkinson and W. & B. Cowan's works in Bell Barn Road—which the members of the Midland Junior Association visited not many weeks ago—the party were received by Mr. W. Cheshire and other gentlemen (including Messrs. E. D. Weippert, D. M. Gibb, H. A. Hobson, and W. D. Cheshire), who had a great number of things to show them; and with such a large variety of processes carried on, there was something that appealed to every visitor. Perhaps, however, it was only natural that the greatest amount of attention should be given to the new high-pressure wet and dry gas-meters which were described and illustrated in the "JOURNAL" for March 14 last (p. 758). It will be remembered that these meters are the subject of two patents, one of which is in connection with a compensating index having variable gearing controlled by a sealed aneroid, which is acted on by the pressure of the gas so as to give a proportionately increased movement with an increase of pressure. Thus the registration indicates the volume of gas at normal pressure whatever the actual pressure may be, provided that it does not exceed the limit for which the meter is made. The second patent has reference to the use of inlet and outlet cocks so coupled together that both are operated at the same time—the inlet being set to open just before the outlet. The large number of different machines employed in the works was noticed.

Those who had acted as guides were heartily thanked for their trouble, on the proposition of Mr. W. S. Smart, seconded by Mr. L. F. Tooth; and Mr. Cheshire replied.

Aluminium castings of every description are turned out at the works of the Birmingham Aluminium Casting Company, in Cambridge Street; but a large percentage of them are in connection with motors. The visitors, on Saturday, however, were mainly concerned with the high-pressure gas-furnaces used for melting aluminium. They had the advantage of the presence of Mr. E. W. Smith, of the Birmingham High-Pressure Gas Department, while Mr. F. W. Gower (the General Manager of the works) and Mr. H. J. Owen (the Works Manager) also afforded much information. Chief attention was given to the new large furnace for high-pressure gas, which has taken the place of temporary trial gas-furnaces. It is claimed that the cost of the gas consumed for melting the aluminium is certainly not more than half as much as was formerly spent on coke; and in every way the plant proves economical. Careful data are being kept as to the tonnage melted and the gas consumed. One thing in favour of the gas-furnace, Mr. Gower pointed out, is that, situated in the centre of a town like Birmingham, as these works are, the carting of ashes is a considerable item; and all this is, of course, saved. Then as there is no stoking-up, a big saving in labour is secured. Another thing is the easy control of the heat. When the metal is melted, it is possible to turn out (say) a couple of burners, and thus control the heat to a nicety. In fact, by this process the aluminium is improved in every way. Then in addition to the saving over coke and the simplicity and ease of manipulation, the life of the pots is considerably increased. The lining of the furnace can be taken out in the course of an hour. There is a loose bottom supported in a very simple way. The metal is not oxidized at all while in the furnace. In the works there is a total of 16 to 18 tons of aluminium melted per week; and as the gas is proving so successful, no doubt this system will be adopted right through, which will mean the employment of about eighteen furnaces. The pots are 500 lb. ones.

Before leaving, the visitors expressed their thanks for the privilege that had been accorded them of examining the installation.

The party visiting the works of the Wolseley Tool and Motor Car Company learned that there are upwards of 4000 men employed at the works, and the output averages 40 cars per week. Several members of the staff conducted the visitors through the whole of the works. The ingenious machinery—a large proportion specially designed for the particular work appertaining to this make of car—was seen in motion; and the explanations proffered proved of great interest. All similar parts are made interchangeable; the maximum error allowed being $\frac{1}{1000}$th part of an inch. A large number of cars were being tried upon the private track encircling a portion of the works, previous to the final test upon the public highway. When perfectly satisfactory tests have been obtained, the cars are dissembled for a final examination. Then the bodies are fitted, and the cars dispatched to the purchasers.

Great pleasure and instruction were derived from the visit; and the party expressed their thanks to the Company for throwing the works open to inspection, and to the guides for the attention received at their hands.

Luncheon.

The morning visits concluded, the different parties made their way to the Grand Hotel, where the Windsor Room had been reserved for luncheon. About 75 sat down; and the chair was taken by Mr. R. S. Hilton, the Secretary and General Manager of the Birmingham Corporation Gas Department, who was supported by Mr. H. E. Copp, Mr. F. J. Bywater, Mr. W. Chaney, and Mr. S. R. Barrett. The Presidents of all the four Junior Associations were present—Mr. L. F. Tooth (London and Southern District), Mr. A. L. Holton (Manchester and District), Mr. R. S. Ramsden (Midland), and Mr. F. Scholefield (Yorkshire). The speech-making at this portion of the day's proceedings was exceedingly short.

Mr. HILTON, after having given the toast of "The King," said he had to do what he was really the worst person to do, because he himself had not been in Birmingham twelve months. That was, he had to offer to those members of these valued Societies who came from a distance a very hearty welcome to the city, from the Midland Senior and Junior Associations, and also, if he might say so, from the Birmingham Gas Department. It had been a great pleasure to see so many visitors there; and he could say, speaking for himself and the rest of the Committee who had had the arrangements in hand, they would have been delighted if the number had been still larger. However, they had a good room full; and he hoped the afternoon would prove as pleasant as the

morning had doubtless done. They were going round the works of the Birmingham Gas Department, where they might find something that would commend itself to them. They in Birmingham had the proud motto "Forward;" and the Gas Department, he thought, were doing their best to live up to it. This was difficult sometimes; but they would see what strides had been made in various directions, which it was hoped would be to the advantage of the gas industry in general and the City of Birmingham in particular. They were engaged in pushing high-pressure gas. Of course, they were not the only town doing this; but they had rather laid themselves out for it—being a place with a large number of manufacturers. He hoped they would visit the laboratory in the town, as well as the high-pressure test foundry at the Windsor Street works, and that their experiences during the day would be sufficiently pleasant to cause them to renew the experiment and come to Birmingham again on a future occasion.

At the conclusion of the Chairman's welcome, the members again split up into parties for the purpose of proceeding to the different gas-works.

Saltley Gas-Works.

Coal gas only is made at the Saltley Gas-Works; and Mr. F. J. Bywater, the Engineer there, explained that the capacity is 12 million cubic feet per day—6 million feet in the horizontal retort-house, and another 6 million feet in the two inclined retort-houses. It is intended at an early date to undertake the replacement of the horizontal plant by carbonizing plant of the most recent type.

In the inclined houses, the retorts are set in beds of eight, and heated on the regenerative system. The coal is discharged from hopper-bottom railway-waggons into receiving-hoppers and coal-breakers below, broken to the required size, elevated, conveyed, and delivered into continuous hoppers over the retort-benches, and fed into the charging shoots. The coke falls direct from the retorts on to De Brouwer conveyors, by which it is removed outside to a small storage hopper—being quenched *en route*. From the storage hopper, the material is loaded direct, by means of shaking screens, into trucks. The conveyors rise at an angle of 22½° to the top of the coke storage hopper. The coal is taken from the continuous storage hoppers into shot-pouch measuring chambers opposite each tier of retorts; the retorts being charged by means of removable shoots. In addition to the shaking coke-screens mentioned above, there are storage hoppers for breeze, and revolving screens for grading this material into various sizes. In the horizontal retort-house, the coal is delivered in the same way into central hoppers over the retort-benches, and fed into the hoppers of the compressed air machines. There are four sets of this machinery for charging and drawing the retorts. All the gas goes into two large holders, which are used in collaboration with the adjoining Nechells works. There it is thoroughly mixed with carburetted water gas.

Particular notice was taken of the gas-washer of the Feld type (having a capacity of 7½ million cubic feet per day) which is used for cyanogen extraction; and also of a bed of eighteen Dessau vertical retorts (in three rows of six retorts) which is being put down by the Vertical Gas-Retort Syndicate (the Contractors for whom are Messrs. Cutler and Sons and Messrs. Leech, Goodall, and Co.) in connection with the coal-test plant, for experimental purposes. They are of the latest pattern; three retorts being operated at one time, instead of single ones, which effects a considerable saving in labour. At the test plant (some particulars of working results at which have quite recently been communicated to the Midland Junior Association by Dr. W. B. Davidson, the Chief Chemist, and Mr. G. C. Pearson) there is already a horizontal plant, capable of turning out over 250,000 cubic feet of gas per day, complete up to the holder. It was stated that in the test works they are at present engaged on special eight-hour tests of 26 cwt. per 24 hours per retort. A Liversedge washer of the centrifugal type could be seen at work here. The advantage of this washer, it was pointed out, is that it enables one to work much better with sludge. It is being used for general experiments at present.

Nechells Gas-Works.

At the Nechells Gas-Works, the Engineer (Mr. W. Chaney) pointed out that there are two retort-houses; but only one is filled. This contains 416 inclined retorts. The output of coal gas is equal to 6 million cubic feet per day; but in addition to this, there are six sets of carburetted water-gas plant of a total capacity of 7 million cubic feet a day—two of 1½ million feet and four of 1 million feet each. The vertical high-speed engines have been replaced by a steam-turbine for driving the four last-named plants. The coke from the retort-house is all dealt with by means of a De Brouwer conveyor, and delivered by a hydraulic crane on to screening plant, for passing into boats or trucks. On one side of the works, there is the canal; and there is also railway communication with either the Midland or North-Western system.

On these works is the laboratory which centralizes the whole of the chemical work of the Gas Department, though, of course, there are branches at the other works. Eight-hour samples are taken in 200 cubic feet collecting holders of all the makes of gas; and these are tested every shift for calorific value, illuminating power, and gas analysis. The laboratory contains testing appliances of all sorts and kinds, besides any amount of other things that are employed by chemists. The high-pressure street-lamps are brought here to be tested; and a portable photometer and a portable collecting holder are ready for use when required. A portion of the laboratory is reserved for research work. The excellent condition of it was remarked upon.

Windsor Street Gas-Works.

The Windsor Street Gas-Works occupy an area of about 26 acres; but Mr. J. Foster, the Engineer, did not let his party miss anything. The productive capacity of the works is about 10½ million cubic feet of coal gas and 4 million feet of carburetted water gas per day; but the visitors noted that there is plenty of room for extension if required. There is storage for 16¾ million cubic feet. In the new retort-house, the horizontal retorts are heated by Hunt's modification of Klönne's regenerative system. Arrol-Foulis hydraulic stoking machinery is used; and there is a Hunter-Barnett pusher. The house is approached by three lines of overhead rails, enabling coal to be dropped from the waggons on to the charging-stage. An arm of the Birmingham Canal also extends within the house; and parallel with it is a railway dock. Coke for screening is now brought out of the house by means of a horse-drawn runway. Four of the skips at a time are taken by the suspended rails to a steam crane, which elevates them and tips the coke into a hopper. After this, it is screened and dropped into railway waggons or other hoppers for the town trade.

It is at these works that the two Worthington compressors have been installed in connection with the high-pressure system. They are capable of supplying 60,000 cubic feet of gas per hour each, at a pressure of 15 lbs. per square inch. It was understood that already an extension has become necessary, and a 150,000 cubic feet per hour compressor is to be put down. Here, also, the visitors saw the high-pressure gas-foundry, where Mr. E. W. Smith was not only ready, but anxious, to tell them all that was possible in the time at disposal on the subject of the utilization of high-pressure gas for industrial purposes. The members saw a crucible furnace, a muffle-furnace, and high-pressure blow-pipes in operation; and all were struck with the "sweet simplicity" of the system. A tube furnace is about to be added to the foundry. What more could be offered to a manufacturer than to let him bring his own metal and his own men along to the foundry, and see for himself what gas is capable of doing? Mr. Smith is evidently convinced that there is an enormous field of which high-pressure gas-furnaces can take possession; and the visitors must have agreed that he is the man to do what can be done in the way of attaining this end.

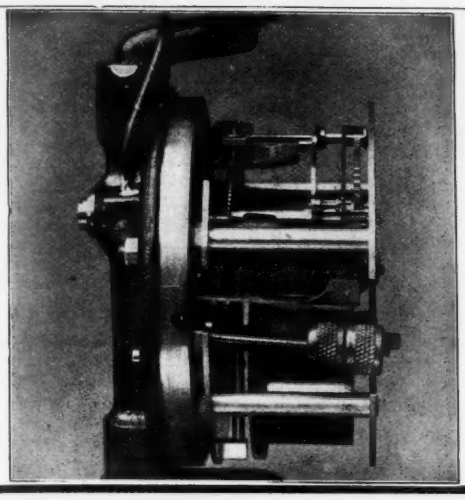
Adderley Street Gas-Works.

Those who went to the Adderley Street Gas-Works were able to see, under the guidance of Mr. C. C. Barber, the new retort-house which was fully described and illustrated in the paper he read before the Midland Junior Association some two years ago. The productive capacity of the house is 1¾ million cubic feet of gas per day; and no water gas is made at these works. The retorts are horizontal, heated by Gibbons and Masters' patent "A.B.C." regenerative furnaces; and the retorts are simultaneously charged and discharged by means of a Fiddes-Aldridge machine. This machine is fed by twin elevators, a push-plate conveyor, and a hopper running the full length of the house. Electricity is employed for working the coal-crusher, coal-elevator, coal-conveyor, and charging machine; the current being generated by a gas-engine on the works. A Telpher transporter has been installed for dealing with the coke. This runs through the retort-house, alongside the wharf, and across the canal (which passes through the works) to the coke loading yard. In the Telpher cab there are two electric motors; one for hoisting and the other for travelling. The coke is discharged from the retorts into cages, and slightly quenched. The cages are then picked up by the Telpher, taken to a tank of water and dipped, and then carried to the required spot in the yard.

Tea—With a Few Speeches.

The gas-works inspections over, the different parties met once again at the Gas Department Recreation Rooms, where they were the guests of the Birmingham Gas Committee at tea. By this time, the number had largely swelled; and the spacious room presented quite an animated scene. Probably it would be about right to say that 140 sat down. Councillor Wilson, a member of the Gas Committee, occupied the chair; and he was supported—in addition to those gentlemen already mentioned as having been present at the luncheon—by Dr. W. B. Davidson, Mr. W. Wastell, and Mr. J. W. Rendell Baker. Letters of regret for absence had been received from (among others) Sir Hallewell Rogers, Mr. T. Berridge, Mr. A. Cooke, Mr. Vincent Hughes, Mr. J. H. Brown, Mr. B. W. Smith, and Mr. R. J. Meiklejohn.

Mr. R. S. Ramsden remarked that, as President of the Junior Association in the centre in which this joint meeting was being held, it was his privilege to express their gratitude to the Birmingham Gas Committee for so kindly throwing open their works for inspection that afternoon—works which, taken in the aggregate, he believed, formed the largest gas undertaking in the country outside the Metropolis. They had seen practically every phase of gas manufacture. They had all been taught to think that Birmingham was the hub of the universe and the centre of civilization; and what they had seen of the manufacturers' works and gas-works tended to confirm this opinion. The programme which, with the help of the Gas Committee, they had been able to put before the visitors had been most comprehensive; and they were certainly grateful



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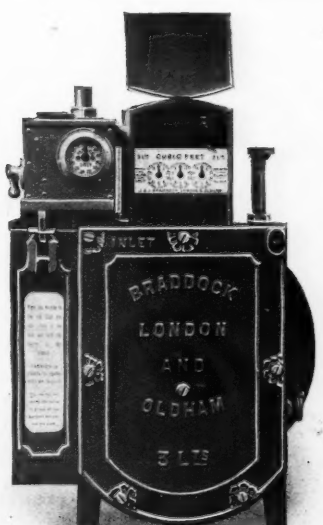

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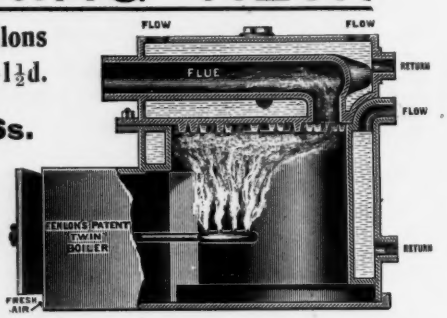

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to the Committee. At meetings of juniors of this kind it was always a great encouragement to the young men to have members of the gas committee concerned among them; and they were all delighted that afternoon to have Councillor Wilson, a member of the Birmingham Gas Committee, taking the chair at the tea. He had much pleasure in moving a hearty vote of thanks to the Gas Committee for their kindness throughout the day, and for entertaining them at tea; and he coupled with the vote the name of Councillor Wilson.

Mr. R. J. Rogers (Birmingham) seconded, and endorsed what had been said. Though a great deal of work had had to be done by the Special Committee appointed to make the arrangements for the visit, the labour had been made much more easy by the assistance rendered by the Gas Committee all through. While the Junior Associations received the support of the members of gas committees and directors of companies which they now enjoyed, the associations, and combined visits of this character, would continue to be a success.

The vote having been carried with applause,

Councillor Wilson, in response, said he did not quite know why he had been accorded the honour of being asked to preside, except, perhaps, that this was a meeting of Junior Associations, and he was a junior member of the Gas Committee, at any rate in point of experience. On behalf of the Committee, he welcomed the members most heartily. The Committee fully appreciated the objects of such Associations, and desired in every way to encourage the valuable work they were doing for the gas industry at large, and to improve their own scientific knowledge and fit themselves, as time went on, to occupy more responsible positions. The labours of the Gas Committee in Birmingham were lightened enormously—in fact, they were only rendered possible—by the loyal staff of workers which they possessed. He fully realized how valuable was the work they obtained from the officers of all ranks. Speaking particularly with regard to municipal undertakings, the object of committees, he believed, was to search out from among their staffs young men worthy of receiving every encouragement and help to fill higher positions. It was obviously to the interest of departments to do this; and so far as Birmingham was concerned, he believed it would be carried out. They were all engaged in a very important work—in fact, one of the most important that could be undertaken by a municipal body. They were engaged in safeguarding vast sums of money which were entrusted to the care of gas committees; and they naturally looked for the best technical assistance they could obtain. And they did not look in vain. There was before the gas undertakings of the country a very hopeful future. Of course, in a large city like Birmingham, they were able to carry out much pioneer work; and he thought it was only right that a big municipality who could afford, and whose duty it was, to become the pioneers of new inventions should render every assistance they could to similar undertakings to enable them to study the latest advances in the science of gas manufacture, &c. If Sir Hallewell Rogers (who devoted an immense amount of his extremely valuable time to the work of the Gas Department) had been present, he would have said how pleased the Gas Committee were to welcome the visitors, and would have expressed the hope that on future occasions they would have the pleasure of welcoming them again.

Mr. F. J. Bywater, in proposing "Success to the Junior Associations," remarked that he would rather the toast had been worded "Continued Success." Success had been absolutely secured; and all the members had to do to retain it was to carry on the Associations in the spirit in which they were being run to-day. He well remembered when the Midland Junior Association was formed that there was a little diffidence and timidity among the seniors, some of whom thought that perhaps the step was not a wise one. Those who held this opinion were very much in the minority; and the more far-sighted view of the majority of the members of the Senior Association, who so splendidly assisted in the formation of the Junior Association, had proved amply justified. He himself was proud to look back on the fact that he was the first President of the Midland Junior Association, and had some slight share in its formation. There was no doubt that the Junior Associations were really occupying an excellent place in the technical life of the gas industry at the present time—affording the members, as they did, an opportunity of studying closely and at first hand those interesting and intricate problems with which the profession was now faced. The Senior Associations had therefore done wisely in supporting the movement. In conclusion, he would like to emphasize the value of absolute loyalty in every sense of the term—loyalty to their traditions and loyalty to their chiefs, which he was certain would mean loyalty to themselves. He knew of nothing that would carry them to success better than loyalty.

Mr. W. J. Liberty seconded, and remarked that that afternoon he felt in no apologetic mood; for he firmly believed, as one of the seniors had said to him, that though some years ago such a movement would not have been tolerated, the formation of the Junior Associations was really one of the best things that had ever been devised for the young men in the industry. The basis of this work was educational. He would have liked to have seen more members present from London that day; but he was pleased to say that the whole of the Council had turned up. The motto of the good old city of Birmingham was "Forward;" and they might take this as the watchward of the Junior Associations. Having banded themselves together thus, they would continue to go forward, not only as associations, but also as individuals.

Mr. W. S. Smart proposed a hearty vote of thanks to the Senior Association; remarking that the Midland Junior Association were deeply indebted to them for the help they had afforded both in the formation of the Association and also since it had been in existence.

Mr. W. H. Johns, in seconding, said that they as a junior body were very thankful for the manner in which the Senior Association had assisted them in connection with that day's gathering. They approached the seniors on the subject, and had received great help from them. A Special Committee was formed to deal with the matter; and they had done their work well.

Mr. L. F. Tooth next proposed a hearty vote of thanks to the Midland Junior Gas Association coupled with the names of the Arrangements Committee of the Midland Association of Gas Managers. They all, he said, united in their sincere thanks for the elaborate programme which had been prepared for them. The whole day had proved both instructive and enjoyable. It was a great honour to have the support of the seniors, who, he was sure, would always receive all possible help in their arduous and responsible duties from the juniors, who would thus justify the support that was given to them.

Mr. F. Scholefield seconded, and expressed his pleasure at associating himself with Mr. Tooth's remarks. There was, he said, no doubt as to the value of a visit of this description to those who took part in it. They would go away with very pleasant recollections of what they had seen and done that day. Though the contingent from Yorkshire was only a small one, those who had come were most enthusiastic about the arrangements that had been made on their behalf.

Mr. A. L. Holton, as Secretary of the Joint Association Committee, supported the proposition, and said the day had passed off most successfully. He could assure them that it had been a matter of genuine sorrow to each Association that the railway companies had refused to grant any special facilities for attending the meeting. That visitors had not turned up in larger numbers, must not in any sense be taken as a slight on the programme. In fact, those present by no means represented the extent of the interest that was taken in the visit. They were grateful for the splendid arrangements that had been made, and for the high tone that had been set for any engagements of a similar character in the future.

The vote was carried with acclamation.

Mr. H. E. Copp, in acknowledgment, remarked that, in the first place, the Senior Association had been credited with a good deal of virtue in assisting at the formation of the Midland Junior Association. He thought, however, it would have been more accurate to have stated that the movement was a spontaneous one; and the way in which the Association was conceived and brought into being was highly creditable to the members, because they had done it entirely "off their own bat." As the hard-worked Secretary of the Senior Association, he read the proceedings of the Junior Association with no inconsiderable amount of envy. He thought their technical fare up to the present had, apart from anything else, amply justified the existence of the Association; and if they could maintain the existing standard in their contributions, they would have a very important bearing on the future of the gas industry. There was no question about this.

Some Evening Visits.

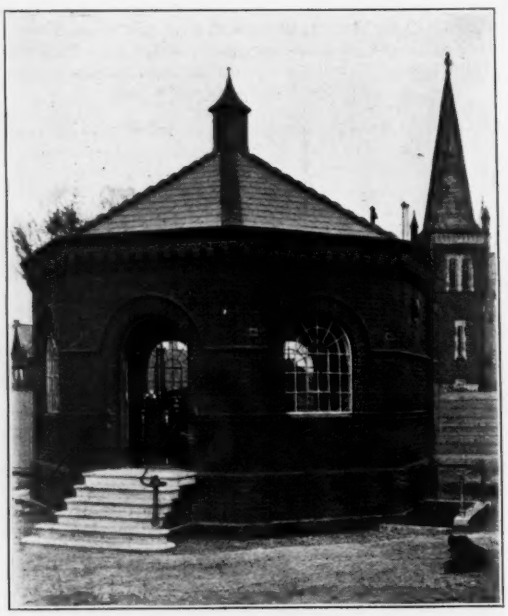
The members who were not required at the Joint Council meeting, then formed into parties for the evening visits. Three of these had been arranged—namely, to the high-pressure show-rooms and laboratory in Newhall Street; the governor-house for augmenting the low-pressure supply at King's Norton from the high-pressure gas-main; and the gas-compressors and high-pressure gas-foundry at Windsor Street. An illustrated description of the Newhall Street high-pressure laboratory appeared in the "Journal" as recently as Jan. 31 last (p. 287); and to this readers may be referred. A second party returned to the high-pressure foundry, where they were perfectly safe in anticipating that they would have an interesting time.

King's Norton High-Pressure Governor-House.

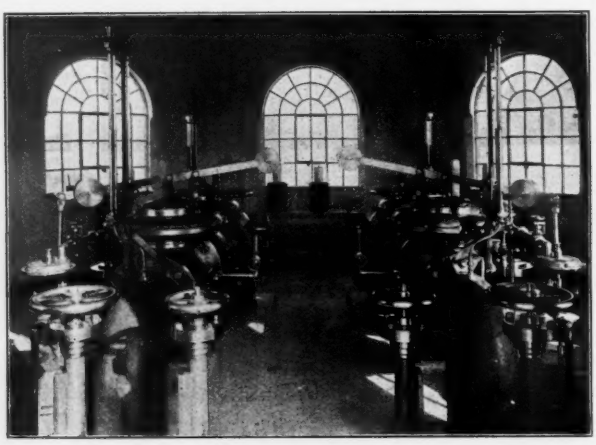
The third party were taken by Mr. James Hewett, the Distribution Engineer, to the governor-house which has lately been put up at King's Norton for the purpose of assisting the low-pressure gas supply in that part of the area from a high-pressure gas-main.

The considerable growth in recent years of the population of King's Norton and Northfield, in the southern portion of the area supplied by the Birmingham Gas Department, rendered necessary an augmentation of the gas supply to these districts; and it was found that this could be more economically effected by the introduction of an auxiliary supply into the heart of the district than by enlargement or duplication of the existing mains. The extremities of the gas-mains in a southerly direction are about 10 miles from the gas-works; and it was decided to lay a 12-inch diameter high-pressure gas-main, about 5½ miles long, from the existing high-pressure mains in the city to a site in King's Norton about 6½ miles from the nearest gas-works, and to instal governors to regulate the pressure at the point of introduction of gas into the existing low-pressure mains there. The installation has been in operation about two months, with most satisfactory results. Charts obtained at the governor-house and at points 2 and 4 miles distant show that the variation of pressure during the 24 hours is but 2-10ths or 3-10ths, as compared with variations of 10-10ths to 15-10ths heretofore.

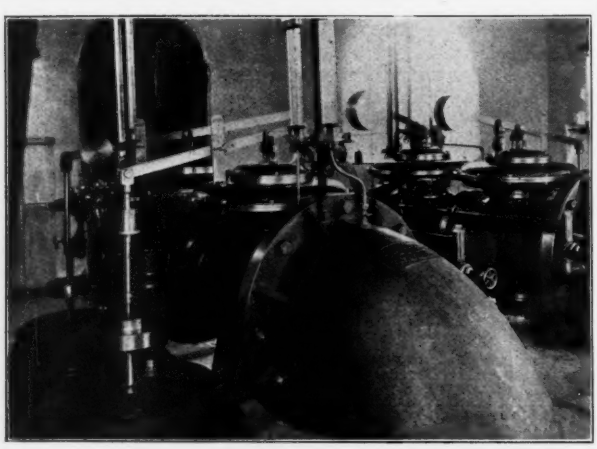
The governors are of the Reynolds patent diaphragm type, made by the Bryan Donkin Company, Limited, of Chesterfield, and have been specially designed to meet the requirements of the Birmingham Gas Department. They are attached to the high-pressure main direct, and reduce the pressure from 15 lbs. to the desired pressure in inches of water on the outlet. The inlet and outlet pipes to the governors are fitted with patent double-faced worm-and-rack valves; and a small pilot-valve is also fixed on each inlet-main, so that when starting up a small quantity of gas can be passed through the governors. The governors are in duplicate; only one set being used, and the other remaining as a stand-by. As the conditions which these governors have to comply with are very exacting, it was decided to govern down in two stages. The first or main governor reduces the pressure of 15 lbs. per square inch to 5-10ths of an inch above the pressure desired on the district; and the second governor reduces this pressure to what is wanted on the outlet-main. Each governor consists of leather-faced equilibrium valves, the spindle of which is connected to a leather diaphragm. To the top of the valve-spindle a lever is attached, one end of which rests on a fulcrum; and the other is attached to a large diaphragm by means of a vertical telescopic rod. This diaphragm is contained in a separate cast-iron casing called an auxiliary bowl.



King's Norton High-Pressure Governor-House.



High-Pressure Governors, showing the 12-inch Inlets.



High-Pressure Governors, showing One of the 24-Inch Outlets.

For dealing with small quantities of gas, an auxiliary system is fitted. This consists of a small high-pressure service regulator, which reduces the pressure to about 18 inches of water. This pressure is further reduced by a low-pressure regulator to that required on the district. The object of reducing in two stages on the auxiliary system is in order that the reduced pressure can be used to act on the underside of the diaphragm in the auxiliary bowl, and so close the valve tightly when no gas is passing, thus preventing the pressure banking-up on the outlet.

The governors are so arranged that before the pilot-valves are opened, the main governor can be shut up completely, and so prevent high-pressure gas rushing through into the outlet-main. A safety governor is fitted between the two main governors, so that, should the high-pressure gas by any chance get through the first governor, this safety governor will prevent the excessive pressure acting on the second auxiliary bowl diaphragm and bursting it.

Bingley Hall Exhibition—And Other Things.

Later on in the evening, those of the visitors who had not already been compelled to start for home turned their steps with their Midland friends in the direction of Bingley Hall, where the Annual Trades Exhibition is now being held. Though not primarily a gas exhibition, gas is an outstanding feature of it. The high-pressure lighting is brilliant, and there are several good displays of gas appliances—foremost among which must be named that of the Birmingham Gas Department. At this point, just one word of thanks on behalf of the visitors should be given to Mr. J. Hewett for the clear and helpful map which he had prepared showing the high-pressure lighting in the Exhibition Hall and a plan of the city with the street lighting units mentioned thereon. Copies of the map were supplied to all the members; and to anyone who looked at it, confusion was rendered impossible.

To return to the exhibition, it is impossible to speak too highly of the high-pressure lighting; and Mr. S. R. Barrett, the Fittings Superintendent to the Birmingham Gas Department, who is responsible for it, is to be heartily congratulated upon the success which has attended his efforts. It is unnecessary to repeat here the particulars regarding the exhibition which were given in the "JOURNAL" for April 11 (p. 101). But it may be remarked that the high-pressure lamps used are the Keith, Glover, "Ukay" (Messrs. Breedon and Sons), "Ovee," and Ehrich and Graetz—6 1000-candle Glover lamps, 42 1000-candle "Ukay," 21 1000-candle Keith, 12 300-candle Keith, 2 2000-candle "Ovee," 33 300-candle "Ovee," and 2 3000-candle Ehrich and Graetz. The general lighting includes 118 of these lamps; and on the Gas Department stand there are 48 80-candle power high-pressure "Ovee" (inverted) lamps, which are arranged in a line round the top, and give a perfectly shadowless light at quite a trifling cost for gas. The approximate consumption of gas per hour for all these lights is 3500 cubic feet; and the total illuminating power, 92,500 candles. In addition to this, of course, there are many small units in use privately for lighting the stands. The lights are supplied from the Corporation high-pressure main, the pressure in which varies from 15 to 30 inches of mercury; a 1½ inches Peebles governor being used, which reduces this to a working pressure of 6½ inches of mercury. The Corporation stand is divided between the domestic uses of gas and high-pressure apparatus; and it is an excellent display, which should result in material benefit to the department. The visitors must also have seen a good deal to interest them at the manufacturers' stands—that is to say, those of Messrs. John Wright and Co., the Cannon Iron Foundries, the Parkinson Stove Company, the Davis Gas-Stove Company, the Richmond Gas Stove and Meter Company, Messrs. Glover and Main, and the "National" Gas-Engine Company. There is also some electricity in the hall; and parenthetically it may be remarked that the 2000-candle flame arc lamps do not show up very well by the side of the high-pressure gas-lamps, which are without glasses, but provided with wire guards underneath. Electricity, it was learned, is generated at a cost of less than ½d. per unit by two 55 H.P. old pattern Tangye gas-engines, which with ten or more years' use have not cost above £15 in repairs. The excellent ventilation of the hall is a point that strikes one forcibly.

Mr. Barrett is an enthusiast; and in a chat with him, the interviewer very soon gets beyond the confines of the Bingley Hall Exhibition. The department are fortunate in possessing some big consumers. For instance, one has two 10,000 cubic feet per hour meters, four 3000 feet, and one 30,000 feet—the last-named, of course, being bigger than the station-meter in many places. Another consumer of high-pressure gas takes 8½ million cubic feet per annum through a 2-inch service, which is capable of supplying even a much larger amount than this. The advent of high-pressure gas has called for the production of a great number of

specialities; but the point that has struck him in connection with the system is its absolute simplicity and the ease with which it can be manipulated. The less complicated an article is, the more efficient is its working. One thing, however, that must be borne in mind in connection with high-pressure lighting is the necessity for turning it on and off slowly. The difficulty of carrying a mercurial gauge about has led, Mr. Barrett points out, to the production of a high-pressure gauge for the use of fitters, &c., when testing. There is an aneroid which, actuated by the pressure of the gas, moves a pointer on a scale at the side.

While on the subject of high pressure, Mr. Barrett drew attention to a "very simple" form of gas-burner he has devised. In fact, it consists merely of a piece of ½-inch gas-tube bent into curves, with a steatite tip. There is no patent here; and it can be made in any size. The gas-jet has a cone fitted, which can be used to close up the air aperture for shaping the mantle. As soon as this is done, the cone is run back into its place; and there is a mantle perfectly formed to the pressure. Several outside lamps have been adapted to this style; and in the Art Gallery there are to be seen two sun-burners, in which four mantles on these burners are taking the place of 22 No. 4 Kern burners with a consumption of 88 feet an hour, and an illuminating power of about 1760 candles. Now the consumption is 16·2 cubic feet per mantle at a pressure of 9½ inches of mercury; and the total approximate illuminating power is claimed to be 5000 candles. This Mr. Barrett points to as demonstrating the advantages of high-pressure gas. In another room, which is lit by four 2000-candle flame arc lamps, it is intended to put a sun-burner consisting of ten of these mantles.

Birmingham is making great preparations for the Coronation; and for the illumination of the Town Hall eight 4-inch gas-services have been provided. The whole of the building will be outlined. There will be an opportunity for making comparisons, too, inasmuch as the Council House close by is to be illuminated by electricity. The points noted here are only a few of those which were gathered in the course of a conversation with Mr. Barrett; but they will serve to show that the Corporation Gas Department is quite "alive."

Street Lighting.

Those members who visited the Exhibition, or who remained in the city during the evening, were able to view the street lighting; and to many, Mr. R. J. Rogers, the Lighting Superintendent to the Birmingham Corporation, acted as guide.

The low pressure gas lighting is on the following scale:—

CENTRE OF CITY.

Principal refuges: Lamps each 650 c.p., clusters of eight inverted burners.
Principal thoroughfares: Lamps each 500 c.p., clusters of six inverted burners.
Secondary thoroughfares: Lamps each 320 c.p., clusters of four inverted burners.
Secondary refuges: Lamps each 320 c.p., clusters of four inverted burners.
By-streets: Lamps each 160 c.p., clusters of two inverted burners.

SUBURBS.

Tramway routes: Lamps each 160 c.p., clusters of two upright burners.
Dangerous corners: Lamps each 160 c.p., clusters of two upright burners.
Other roads: Lamps each 80 c.p., one upright burner.

The high-pressure gas lighting in Victoria Square comprises nine groups of three Sugg circular globe lamps, each fitted with two 500-candle power burners and one 200-candle power, and eight single-column Sugg lamps containing the same number of burners in each lamp. On the Town Hall side of Victoria Square one group of three lamps is fitted with Keith inverted burners, one group with Sugg burners, and one with Glover burners, each lamp being of 1500-candle power (nominal). The whole of the lamps in Victoria Square are now supplied with high-pressure gas from the high-pressure mains; and the lamps are lighted and extinguished by the manipulation of the valves in the control-room in the Council House. The three upright high-pressure burners in each lamp are alight from sunset to 11 p.m., when the two burners are extinguished; the third remaining alight until sunrise. On the refuge in the road at the junction of New Street and Corporation Street, two Keith 3000-candle power inverted lamps are fitted. In Stephenson Place, six Thomas Glover type lamps of 3000-candle power each are installed. The high-pressure lighting in Victoria Square, the refuge lamps above referred to, and the lamps in Stephenson Place, are maintained by the Gas Department; other street lighting being maintained by the Public Works Department. In Corporation Street, on the refuges at the top of Martineau Street and Union Street, and on the refuges at the junction of High Street and New Street, Keith inverted burners have been fitted into the existing lanterns; a cluster of four inverted burners in each lamp giving a candle power of 2500. A cluster of Keith inverted burners giving a total of 1500-candle power has been fitted into a low-pressure lantern at the corner of Temple Street and New Street.

This lengthy account is in reality no more than an outline of Saturday's proceedings; but it will give some idea of how much there was for the visitors to see.

At the fifty-fourth general meeting of the Institution of Mining Engineers, to be opened in the rooms of the Geological Society, Burlington House, Piccadilly, W., on the 1st prox., under the presidency of Dr. J. B. Simpson, a paper on "The Otto-Hilgenstock Direct-Recovery Process and its Application" will be submitted by Mr. Ernest Bury.

AN ULTIMATE LIGHT STANDARD.

At the Meeting of the Royal Society last Thursday, a communication by Professor A. Gray, F.R.S., was read by Mr. R. A. Houstoun. It was entitled "On the Absolute Measurement of Light: A Proposal for an Ultimate Light Standard." The following is the Society's official abstract.

A thermopile cannot be used for the measurement of candle power, because it gives the same value to the energy of every wave-length, invisible as well as visible. The author has, however, found by spectro-photometric investigation in the ultra-violet, visible, and infra-red parts of the spectrum, that, if a filter consisting of aqueous solutions of copper sulphate and potassium bichromate in a particular strength in glass cells be placed before the thermopile, then this filter stops the ultra-violet and infra-red entirely, and lets through a fraction of each wave-length in the visible spectrum proportional to its visibility. In other words, it weights each radiation according to its visibility.

The voltage on a tantalum lamp was varied over a wide range; and its candle power, as read by thermopile and filters, agreed well with the readings of a photometer. Owing to the high sensitiveness of the galvanometer required, the method is not suitable for commercial application, except perhaps for integration photometry, when a number of thermopiles might be connected in series with the one galvanometer.

The importance of the method lies in the fact that it provides a satisfactory basis for heterochromatic photometry, independent of the Purkinje phenomenon at all intensities. The author, therefore, proposes to use it for defining the unit of light intensity. He would define the latter as that source, the total intensity of radiation from which at a distance of one metre after passing through his filters would be "x ergs/sq. cm., sec." For the standard candle "x" should be about 0·8.

Whitehead's Automatic Sampling Machine.

At the stand of the Comet Chemical Company at the Chemical Engineering and Industries Exhibition, which, as mentioned elsewhere, was opened at the Agricultural Hall, Islington, on Saturday, Messrs. Brotherton and Co., Limited, of Leeds, are showing one of the above-named machines, which are intended for taking samples automatically, and at stated intervals, of liquids either in process of manufacture or in course of being received or delivered. The sampling is effected by means of a clockwork movement, with which is connected a disc or table on which are placed the bottles or other vessels intended for the reception of the samples. Should the discharge be intermittent and for short periods, a sample can be taken as often as desired; and the time registered when the sample was taken. Thus a complete check is put upon the operator night or day.

Coke-Oven Gas.

The article we published recently, in regard to coke-oven gas in the Rheinisch-Westphalian industrial districts, has apparently had some effect. The "Journal für Gasbeleuchtung" reproduced it, and the following reference to it appeared in "Die Post" of the 5th inst.: "The Town Council of Ronsdorf have followed the example of Wermelskirchen and Ohligs, and have unanimously declined to take their gas supply from the Rheinisch-Westphalian electricity works. In coming to this decision, they were influenced by the following reasons: If a commune takes coke-oven gas and gives up its own gas-works, the consumers will naturally have to obtain the coke they require from the coke-ovens. These will, therefore, have to produce more coke again, and consequently more gas; and if this additional quantity of gas is to be utilized, still further coal-gas works will have to be shut down. By taking gas from the coke-ovens, the public would not get their gas any cheaper; while, on the other hand, they would have to pay more or their coke. In addition to these general factors, there is, in he case of Ronsdorf, the special reason that the gas-works were only last year provided with modern and expensive plant."

The late Mr. C. D. T. Bushell.—When referring in last week's "JOURNAL," to the death of this gentleman, mention might have been made that he was for a number of years a member of the West Bromwich Town Council and Chairman of the Gas Committee. Before commencing the business at the Police Court on Monday last week, Councillor W. Lawley (the presiding Magistrate) and Alderman J. H. Blades made reference to the death of Mr. Bushell, saying that for many years he had been a very useful member of the Borough Bench, and one of the town's most valued public men.

Income-Tax Allowance for Depreciation.—The appeal made in respect of an allowance for depreciation on plant and machinery on behalf of the Lurgan Gaslight and Chemical Company, Limited, which was argued by Messrs. W. A. Schultz and Co. before the Special Commissioners at Armagh on the 13th of October last (when the principle of an allowance for depreciation was granted and the amount left over for further consideration), has now been settled. The allowances have been agreed at the following rates: Mains, 2½ per cent.; machinery and retorts, 5 per cent.; meters and stoves, 10 per cent.

THE STUDY OF SCIENTIFIC ILLUMINATION.

The Annual Meeting of the Illuminating Engineering Society was held at the Society of Arts last Tuesday—the PRESIDENT (Professor S. P. Thompson, D.Sc., F.R.S.) in the chair. The principal matter before the members was the annual report of the Council, which was read by the Hon. Secretary (Mr. L. Gaster). The report was interesting from the point of view of the indication it afforded of the progress of the study of scientific illumination, in connection with which the Society have done a good part.

EXTRACTS FROM THE ANNUAL REPORT.

During the past session, the value of the impartial and international platform afforded by the Society has been freely acknowledged. Several important subjects have been dealt with, and have aroused the interest of other Societies and Associations who sent representatives to join in these discussions. It may be added that the Society experienced no difficulty in finding subjects for discussion; the problem has again been how to deal adequately with the subjects broached in the time available.

Growth of Interest in Illuminating Engineering.—The development of general interest in illumination, which was commented upon in the two previous reports, is still proceeding. Not only are there many more articles on the subject in the Technical Press, but the variety of societies and associations which now devote special attention to one or other aspects of illuminating engineering is very striking. Among those which have been prominent in this respect we may mention the Institutions of Gas and Electrical Engineers, the Royal Sanitary Institute, the Royal Photographic Society, the Institution of Sanitary Engineers, the Optical Society, and the Junior Institution of Engineers, &c. Special acknowledgment should also be made of the assistance that has been rendered to the Society's work by the Press.

Education in Illuminating Engineering now Desired.—There are, however, certain aspects of illumination which attracted special attention last year. The electrical and gas industries alike have been considering the best means of interesting the general public in lighting matters, and have organized campaigns with this object. At the same time there is a rising demand for better educational facilities. A notable step was recently taken by the Johns Hopkins University (Baltimore, U.S.A.) in organizing a special post-graduate course of thirty-six lectures in illuminating engineering, delivered by eminent authorities in their respective fields. In this country, a movement is on foot for the organization of courses of instruction in various technical colleges and institutes. A course of lectures of this kind recently took place at the Westminster Technical Institute, in which the various illuminants were dealt with in turn, and such questions as street, school, and factory lighting received attention.

Industrial Lighting.—Among other questions that have been brought prominently forward may be mentioned industrial lighting. The necessity for more precise recommendations on the subject of factory and industrial lighting has also been pointed out in influential quarters. The report of H.M. Chief Inspector of Factories for 1909 dealt with the subject even more fully than in the past. Industrial lighting also assumed a prominent place in the deliberations of the Second Congrès International des Maladies Professionnelles, held in Brussels in September, 1910, under the patronage of the Belgian Government. A number of important papers were presented, dealing with various aspects of the subject, and the question of providing adequate illumination in the case of dangerous machinery was mentioned as a matter of special moment. This last question has also been the subject of special comment in the report just issued by the Departmental Committee on Accidents in Factories. Statements by representatives of the Society of Ironfounders, the Brass Workers' Society, and by other witnesses are quoted to the effect that inadequate illumination has been a frequent ground for complaint. Several inspectors make the same remark, adding that "inadequate lighting is a very frequent cause of accident and of grave danger." This matter of factory and industrial lighting has been singled out by the Council for special comment, since it appears to illustrate, in an exceptionally happy manner, the way in which the international and impartial influence of the Society is making itself felt.

Membership and Support.—During the past session, the influence and membership of the Society have made steady progress. The number of members now exceeds 270; and it is equally gratifying to note that the Society continue to attract the support of many eminent authorities in various parts of the world. The membership is still of an extremely representative character; the various sections being substantially the same as last year, and proportionately distributed as follows:—

	Per Cent.
Electrical engineers and members concerned mainly with electric lighting	35
Gas engineers, manufacturers of gas appliances, &c.	20
Professors of physics and engineering, experts in photometry, &c.	13
Representatives of oil, acetylene, petrol air gas lighting, &c.	7
Physicians, oculists, opticians, &c.	10
Architects, surveyors, &c.	3
Miscellaneous, including makers of shades and reflectors, mechanical engineers, and others not exclusively connected with any one system of lighting	12

The maintenance of this diverse membership without undue preponderance of any one element is very satisfactory. There is, however, one section which it is still desired to see more fully represented—namely, the architectural and allied professions.

The Council desire to express their appreciation of the great privilege enjoyed by the Society in having Professor Sylvanus Thompson as President during the first two sessions. In spite of the many calls on his time, the President has devoted himself to the work of the Society, which, in its initial stages, has derived the very greatest benefit from his ripe judgment and experience. [Mr. Gaster interpolated the remark here that the Council thought the best way of showing their appreciation of the work of Professor Thompson was by electing him an honorary member.]

With deep regret the Council record the death of two valued members of the Society—Dr. M. Corsepius, of Cologne, and Mr. A. Colson, of Leicester.

A review of the technical proceedings of the Society during the year followed. Proceeding, the report dealt with the

International Attitude of the Society and Co-operation with other Bodies.—The account of the papers read during the session may serve to show the methods of co-operation being pursued by the Society. It is hoped that, as the practical applications of illuminating engineering continue to receive a fuller share of attention, many matters will be discussed which are of considerable interest to other outside bodies. Acknowledgment should next be made of the great benefit derived by the Society from the assistance of its many corresponding members in these discussions. The interest attaching to the discussions on school and library lighting, for example, was largely augmented by the presentation of such communications; and the proceedings of the Society have been followed with keen interest by its representatives in foreign lands. This international connection is of great value in promoting the interchange of views on illuminating engineering among the greatest authorities in different countries, and should do much to pave the way for international agreement on such questions as the nomenclature and terminology of illuminating engineering.

As explained in the report for 1909-1910, it is the special desire of the Society to assist and take part in International Congresses and gatherings at which matters of interest connected with illumination are discussed, and which provide opportunities of arousing interest in these questions. A valuable precedent in this respect is supplied by the Second International Congrès International des Maladies Professionnelles which was held in Brussels in September, 1910. It was very gratifying to find that the subject of industrial illumination was allotted a prominent position in connection with industrial hygiene; and the Council gladly availed themselves of the invitation to send delegates to the Congress. It may confidently be predicted that the efforts of the Society in this direction will bear good fruit in the future, and its work has already received the stamp of approval in various influential quarters.

In referring to the international expression of interest in illuminating engineering, a word or two may be said as to the progress of the Illuminating Engineering Society in the United States. The expectations of the continued prosperity of the movement originated in that country have been completely fulfilled, and, in the light of this experience, we have every reason to hope for similar sustained prosperity. During the past year, the membership of the American Illuminating Engineering Society (which at a corresponding period last year already exceeded 1000) has increased by over 50 per cent.

Standard Specification for Street Lighting.—It will be recalled that at a meeting of the Society on Dec. 9 the President announced that the Council had appointed a Committee to consider the best steps to be taken in framing a draft standard specification for street lighting; and letters were subsequently sent to the Institutions of Gas and Electrical Engineers inviting co-operation on this matter. Subsequently the Council were informed that the Institution of Electrical Engineers were also considering the formation of a Joint Committee on which the Institutions of Gas and Electrical Engineers, the Illuminating Engineering Society, and the Association of Municipal and County Engineers were invited to be represented. A letter from the Institution of Electrical Engineers was received desiring that the Illuminating Engineering Society should appoint several gentlemen to act as delegates. The Council resolved to accept this invitation; and five representatives of the Society were appointed. It is also interesting to observe that a considerable number of the delegates acting on this Joint Committee are members of our Society. In requesting these gentlemen to act as delegates, it was pointed out that the action of the Society in being represented on this occasion should not prejudice its opportunities of future independent action, more especially as the priority in forming a Committee to deal with the matter rested with our Society, and because the international and impartial attitude of the Illuminating Engineering Society marked it out as specially fitted to undertake this work. Meetings of the Joint Committee are proceeding with a view to arriving at some common ground of agreement before drawing up a tentative form of specification.

It is conceded that the adoption, even tentatively, of a street lighting specification such as would meet with common acceptance, would be of considerable benefit in forming a basis of agreement as to what constitutes good street lighting.

Whatever be the upshot, however, the mere fact of it being possible for representatives of different systems of lighting and others interested to meet together with a view to co-operation for their mutual advantage is no small thing; it is also surely a striking testimony to the growth of the spirit of toleration which the Illuminating Engineering Society desires to see established.

Future Work and Outlook for the Next Session.—In conclusion, it need only be said that the prospects of the Society are even brighter than at the conclusion of the Society's first year of existence, and that the past session has again been of a most encouraging character. In the first session, the discussions dealt mainly with principles; in the second, it has been found possible to deal in greater detail with practical applications. There are now facing us many important practical problems to be solved, and many outlets for the possibilities of valuable service, and there seems no less reason than ever to anticipate any difficulty in finding ample material for discussion.

Mr. T. E. RITCHIE moved the adoption of the report, which he thought erred on the side of modesty. It also failed in giving an adequate indication of the great debt the ordinary members owed to the Council. Under the leadership of the President, they had done a great deal of work, the benefit of which had yet to come.

Mr. V. H. Mackinney seconded the motion, which was unanimously carried.

New Members of Council.

The President remarked that, according to the constitution of the Society, the Council had for the first three years to look after its own membership in replacing the members who retired or in adding to their numbers. The action was purely autocratic for the first three years. The names of gentlemen invited to act as members were: Dr. T. Kerr, Dr. W. M. Bayliss, Dr. W. E. Sumpner, Mr. S. E. Thornton, and Mr. O. P. Macfarlan.

Votes of Thanks.

Mr. F. W. Goodenough moved a resolution, to the effect that the members, in tendering a very cordial vote of thanks to Professor Thompson, for his services as President, desired to express their appreciation of the privilege enjoyed by the Society in receiving his assistance and support, and of the great benefit derived from his guidance and experience during the first two years of existence. In proposing the adoption of the resolution, he (Mr. Goodenough) did not think he need add anything to its terms. They all recognized the great debt of gratitude they owed to Professor Thompson, not only as a brilliant figurehead of the Society, but as an active worker on its behalf. They had had in their President a combination of sound scientific knowledge, business-like management of affairs, and an exercise of courtesy and urbanity which it would be impossible to equal in connection with any Society, and which would make it a difficult task for his successor to follow him.

Mr. R. S. Wallis Jones, in seconding, remarked that the members owed to Professor Thompson the firm foundation on which the Society was established. He had given them not only of his scientific knowledge, but they were indebted very greatly to him for the good discussions that had taken place. He had also acted as a sort of general peacemaker between the various gentlemen who represented such widely divergent interests as their members. In that room they had been able to meet and discuss subjects of a very contentious nature without any difficulty whatever, and to get the best scientific data from them.

The motion was heartily passed.

The President, in his acknowledgment, observed that it was an honour to him, and would remain with him an honour, to have been invited to occupy the chair. They had had two years of real hard work. He was disquieted when a year ago the proceedings were on such general lines, but it had been a gratification to him that, during the past session, the papers had taken more direct and more practical lines. They would continue now to go on specializing and talk less of generalities, and discuss more direct and technical problems. The Council were not yet in a position to disclose the name of the future President; but when the name was heard in due course, the members would be gratified. The Council had gone a little further in organization. They had added the name of Dr. Parsons to the list of Vice-Presidents; and they had taken the step of choosing a Chairman who would act in the absence of the President. The choice of the Council of a Chairman had fallen upon Mr. F. W. Goodenough. During the year, two of their distinguished members and personal friends of his own had passed away—M. Corsepius, of Cologne, and Mr. Alfred Colson, who was at one of their meetings last session. It was rather interesting that both these gentlemen represented the two balancing sides of the Society. Mr. Colson was the Gas and Electrical Engineer of Leicester. He was a personal friend of his own. They had visited each other in their homes. Mr. Colson was a splendid worker, a good organizer, and a man of great character; and everywhere that he was known his presence was much valued. It had been a distinct loss having such a valuable personage taken from their membership. Referring to the work of the session, he said that, through the Society, they had made distinct progress in knowledge. They had now, among other things, through the work of their Assistant Hon. Secretary (Mr. Dow), definite statistical information about the lighting of libraries and schoolrooms. There was much work still to be done; and the world was not standing still. They were going to have the Coronation celebrations; and he ventured to think that all the most magnificent examples of illumination which would be made during the festivities would be accomplished by violating all the rules that the Society had been laying down for the lighting of buildings. They would have as much glare as possible; and extraordinary displays of unnecessary amounts of light for the purpose of producing what was usually called "illumination." Everything would in a certain sense be much exaggerated. Members would possibly find time to study the extraordinary and outstanding effects. They had seen progress in another way. He thought it would have been impossible in so short a distance of time as eighteen months ago, when the Society was founded, to have had a serious project for street lighting laid before a municipality conjointly by gas and electricity companies. On the merits of the scheme he had nothing to say, except that because it was conjoint, he welcomed it. It should be possible to get for each illuminant a basis for its own work. Doing work conjointly, instead of by hostility, was a great thing indeed. It was part of the work of the Society—this pacification of interests; this helping of the different branches of the Society to work together, and work towards a common end. Two years were nothing in the life of a Society; and though the benefits of the work accomplished had yet to come, they might congratulate themselves. He thanked the members for the resolution they had passed; and when he quitted the presidential chair in the autumn, and handed it over to his successor, he should feel that he was leaving it when progress was in full blast, and that they had men, with the interests of the Society thoroughly at heart, who were competent to carry it forward.

Mr. A. P. Trotter proposed a vote of thanks to the Council and officers, especially mentioning the Hon. Secretary (Mr. Gaster) and the Assistant Hon. Secretary (Mr. Dow).

Mr. Rawlings seconded; and the motion was heartily carried.

Mr. Gaster having replied,

The Auditors were thanked on the proposition of Mr. Haydn Harrison, seconded by Mr. C. W. Hastings.

Proposed by the President, and seconded by Professor A. G. Vernon Harcourt, the Council of the Society of Arts were cordially thanked for the privilege of using their classic hall for the meetings of the Society.

The President announced that the Council had nominated two Committees—one to deal with school lighting, and another to deal with library lighting. It was hoped that in the autumn some results from their deliberations would be found.

ILLUMINATION BY GAS AND ELECTRICITY.

This was the subject of a paper read before the Junior Institution of Engineers last Wednesday by Mr. Frank J. Hawkins, of Rugby. It will be seen, from the following extracts, that it dealt with matters which have lately been much before our readers in connection with the Illuminating Engineering Society.

The value of the work of the illuminating engineer becomes increasingly recognized as the importance of conferring with a specialist in illumination before determining the details of any lighting installation is realized. Architects have already devoted attention to the question of the lighting of interiors in an efficient and artistic manner; but whereas in the past very little, if any, special study has been made of the best means of carrying this out, the architect is now working in conjunction with the illuminating engineer, with improved results.

To institute a comparison between illuminants, or to definitely state the advantage one illuminant may possess over another, would be a very difficult matter, owing to the many different conditions one may have to take into account before deciding upon any particular method. Whether the lighting of premises or of thoroughfares is being considered, it is the duty of the lighting engineer to recommend the adoption of an illuminant which will maintain the greatest lighting efficiency at the least cost. In the following notes, the writer's object will be to express an unbiassed opinion as to the best form of illuminant to use in various places and under different conditions, and to offer suggestions as to the correct placing of the light units, in order to produce good distribution and effect.

Recent Progress.

During the past few years, rapid strides have been made by gas and electric supply authorities towards the production of more efficient lighting. With reference to gas lighting, a great advance was accomplished by the introduction of the inverted burner, which possesses such distinct advantages, as regards direct light distribution, over the upright burners first used. And later there were the high-pressure burners, which have recently been introduced in street lighting, where efficient and high candle-power units are considered necessary. At the same time, improvements have been made in methods of gas manufacture, which, in themselves, have produced more efficient lighting results. Recent developments in electric lighting have been mostly due to the introduction of the metallic filament lamp, which has opened quite a new era. Improvements have also been made in the construction of flame arc lamps; the high lighting and consumption efficiency having led to their extensive use for street lighting.

The effect upon the eye of a bright source of light, when placed directly in the field of vision, is to cause the pupil to contract, with the result that the luminosity of other moderately bright objects is enormously reduced, and they appear very dark and indistinguishable in comparison with the source from which their light is derived. For this reason, a bright light placed between the eye and the object it is illuminating may render it impossible to distinguish the latter at all. The effect thus caused is commonly called "glare." Until quite recently, lighting in general, particularly shop-window lighting, has been subject to severe criticism, due to bare light units being placed in the centre of windows in quite a haphazard fashion, producing a glaring effect upon the eyes, and consequently reducing the effective illumination upon the articles in the window. In all methods of illumination, glare should be avoided.

This, without doubt, is the principal problem before the lighting engineer; and until this fact is fully realized, effective illumination cannot be obtained. Gas and electric light industries are continually aiming for higher candle-power units, with apparently no thought as to the effective distribution which it is possible to obtain from them. For example, a 400-candle power high-pressure gas-mantle or metallic filament lamp has to be shaded by some form of reflector, or even by an entirely frosted or dense opal globe, probably absorbing from 40 to 50 per cent. of the light, before the required illumination is obtained. This is

a fact which is not often realized; but it is an important one from a consumer's point of view.

Street Lighting.

The subject of street lighting has been one of keen discussion between gas and electrical authorities during the past few years; and owing to increasing traffic, mainly with fast motor vehicles, the question of the perfect illumination of thoroughfares has become one of considerable importance. The two main features to be aimed at are absence of glare and uniform light distribution. To obtain minimum glare effect, the angle between the line of maximum candle power and the vertical should be as small as possible, so that the light source may be removed from the centre of the field of vision, when the eye reaches the point towards which the maximum candle power is directed. Observations as to the angle of "zero glare effect" naturally differ. The writer, however, chooses an angle of 30° to 40° to the horizontal as being an average one at which direct glare can be eliminated.

It is the usual practice, in lighting main thoroughfares, to use very high candle-power units placed at fairly long intervals; but though units of low candle power, correctly spaced, are apparently the most suitable for obtaining ideal illumination conditions, the cost of installation, maintenance, &c., are disadvantages in the adoption of the system. Good illumination is obtained by units of very high candle power mounted at a height of about 30 feet. An example of this will be found in the central suspension system of lighting in Cheapside. In thoroughfares bordered by high buildings, this method of lighting has advantages over the standards generally employed, as an equal amount of light reaches each side of the street, and consequently, where buildings are of a light colour, considerable reflection is obtained. A great objection to the very high candle-power units mounted in low positions is that the sharp shadow contrasts obtained produce a glaring effect, apart from that caused by the lamp itself. The lighting of main thoroughfares by the central suspension method has been recently taken up in this country by both gas and electric authorities. In London, the eastern end of Cannon Street has been installed with central hanging gas-lamps from cross wires; the gas being conveyed to the lamps either by flexible metallic tubing or by barrel with flexible joints, enabling the lamps to be drawn to the side of the street, and lowered for purposes of maintenance. [See "Journal" for Dec. 20, 1910, p. 838.] Although this system has not been employed to any great extent in this country, several towns in Germany have had it in use for some time past. There is much room for improvement in the lighting of side streets. The use of correct reflectors and shades would make a great difference. Lamp-posts have to be placed on the footpath, and this condition alone makes it a very difficult matter to produce effective illumination. A reflector is required which will shield the light from the eyes of pedestrians, and at the same time give maximum illumination on the road.

Illumination of Interiors.

It is most difficult to furnish definite data on the amount of light or power required to illuminate a given area. There naturally exists a wide difference of opinion as to the volume of light which may be called satisfactory for a given set of conditions. These are so variable that it is practically impossible to lay down a set rule; the amount of light required varying with the physical dimensions of the hall or room, the height and colour of the ceiling and walls, and the obstructions in the centre of the area illuminated. Therefore, each building illuminated presents a different problem to the illuminating engineer. Modern light sources have a very high intrinsic brilliancy, and consequently, where used for interior illumination, it is necessary to diffuse the light in order to prevent direct glare. There are numerous forms of shades and globes utilized for this purpose; and although by many the light is softened, the waste by absorption is great, and the efficiency of the light source is correspondingly decreased.

A well-illuminated shop window appears very attractive, and is, without doubt, a splendid advertisement. The determination of the best form of lighting is, to a great extent, dependent upon the nature of the material or articles to be illuminated; and while endeavouring to produce an even illumination upon the whole of a window, the presence of fairly sharp shadow contrasts, in the case of small articles, such as jewellery, is advantageous. The most effective form of window illumination is that obtained by tubular lamps placed round the inside of the windows; the light being entirely reflected upon the goods displayed. By this means a beautifully even distribution is produced. A similar effect can be obtained with ordinary electric lamps and gas-mantles used in conjunction with suitable reflectors. An interesting form of gas-burner with an inclined mantle, which has been designed by M. Greyson de Schodt, may be used with advantage in window lighting, as the light emitted can be utilized in a more efficient manner than can that obtained with the ordinary type of burner.*

The best method of utilizing units of high candle power for window lighting is to fix them at the top of the window, with a reflector which will direct the light downwards, and at the same time prevent direct rays from striking the eyes of a person looking into the window. The illumination of a window from the outside by means of high candle-power units has no particular advantages over other methods, except in the case of a window which is set out in such a manner that it would be difficult to instal light on the inside to illuminate the whole of the window effectively. As to the use of lamps of high illuminating power in the front of windows, the writer is of opinion that it should be entirely unnecessary. The illumination of a road and footpath should be provided for by correctly spaced street-lamps; and unless this principle is realized, and no other lamps are fixed along a thoroughfare, the whole study of street lighting—to produce even distribution and absence of glare—becomes a farce.

A great deal could be said in criticism of private lighting installations of to-day. In the majority of cases, however, the unscientific manner in which gas and electric installations were laid in the first instance is more or less responsible for existing conditions. Householders will not go to the expense of re-arranging their installations, which may necessitate the replacing of existing fittings, &c., in order to obtain better lighting results. The only improvements, therefore, which can usually be effected to existing installations, without causing appreciable expense, must be due to the adoption of special globes and reflectors to diffuse, and also concentrate, the light in a desired direction. In making suggestions as to the best manner in which to illuminate a dining-room or a drawing-room, the lighting engineer is confronted with many difficulties. In the first place, his taste for artistic effect and colour contrasts may differ considerably from that of the householder whom he is advising. The question of low consumption of energy is also an all-important consideration; the figure to be worked to being a very limited one in many cases. With the very general method employed in illuminating rooms by means of a fitting suspended from the centre of the ceiling, there is the disadvantage, in the case of a room of average height, of the lights being in a very low position, and consequently having to be shielded from the eyes in such a manner that the general illumination of the room is considerably impaired. The method can be used with advantage, however, in the case of a dining room, where the table is the principal area upon which the illumination is required. A simple shade for this purpose may be made of a brass frame with a silk flounce attached. It could be produced very cheaply, and possesses many advantages over the ordinary fitting; among them being: (1) Elimination of glare; (2) if three or four light pendants, general appearance unchanged when one or two lights are extinguished; (3) reflection from ceiling obtained, which, in many cases, is the only portion of the room where the reflection is of any consequence; (4) portable and easily replaced.

In comparing the value of gas with that of electricity for private lighting, much could be written. Discussions have taken place regarding the hygienic effect of each illuminant; some being of opinion that they are both of an equality in this respect. It is held by others that, owing to the combustion which is continually taking place in a gas-flame, deleterious fumes must be emitted. But it must be borne in mind that, provided gas-burners are kept in good condition, and regulated to consume a correct portion of gas and air to effect complete combustion, no trouble is experienced from a hygienic point of view. An important consideration is that the heat from a gas-mantle conduces to good ventilation.

Public Halls.

The general method of lighting concert halls, which usually have fairly high ceilings, is to arrange artistic clusters of lamps in a symmetrical fashion. By this means, good illumination is sometimes obtained; but in many cases, owing to incorrect spacing of light units, there is great room for improvement. The method, however, can be made very effective, if the lights are correctly spaced, and the lamps fixed at a considerable distance from the eye, thus making the glare effect very small. The indirect, or inverted, method of lighting produces a good, even illumination, but the objection to it is the waste of light owing to bad reflection from ceilings, which are usually coloured and ornamental. A great deal is to be said, however, in favour of the indirect method of lighting, which will, no doubt, be more extensively adopted in the future, especially with the use of arc lamps.

Future Aspects of Illumination.

It is only quite recently that illumination has been studied from an engineering standpoint. The rapid developments taking place have created considerable interest among many scientific and practical men. Although naturally there is rivalry between the advocates of the respective illuminants, the subject is regarded quite impartially by the lighting engineer, whose main object it is to study resultant effect. If the best resultant illumination is always kept in view, each illuminant will advance by merit, according to its capabilities of distributing light in an efficient and effective manner. A form of lighting which has prospects of developing into extensive use is the Moore tube-light, with which even distribution can be obtained at a low cost. Mercury vapour lamps may also be used extensively in the future. The principal objection to them is the peculiar colour of the light emitted, which, however, will, no doubt, be eventually overcome. An attempt has already been made to modify the colour by mixing with it light of a different colour; the resultant light obtained being a vast improvement upon the original. In one case, a gas-mantle provided a very satisfactory complement to the light produced by the mercury vapour lamp, when the light from each source was in the ratio of 1-candle power mercury vapour to 0·57-candle power gas-mantle—this containing 0·75 per cent. of cerium. The tungsten lamp has also been used in conjunction with the mercury vapour lamp;

* The burner referred to was described and illustrated in the "Journal" for June 28, 1910 (p. 951).

the best result being obtained when the ratio of mercury vapour to tungsten light was 1 to 0·54. The Nernst lamp is of considerable interest, owing to the fact that it constituted the first use of rare earths for electric lighting purposes. The future aspects of gas lighting seem to centre upon the further application of high-pressure burners. The progress of the past year indicates that efforts are being made in this direction; and there is no doubt that at the present time high-pressure gas lighting holds a very strong position in the illumination world.

[During the reading of the paper a large number of lantern views were thrown upon the screen, a considerable portion of them showing the new lighting in the streets of Westminster, as well as indoor inverted gas lighting for art schools, class-rooms, factories, and West-End show-rooms; also some of the newer forms of inverted arc lighting for indoor purposes in schools, &c.]

Discussion.

Mr. WALDRAM (late Chairman of the Institution), in opening the discussion, remarked that the science of illumination had been largely adopted in America, but not to any extent in England.

Mr. HAYDN T. HARRISON complimented the author upon his paper, and said he quite agreed with him that there was much room for improvement in the lighting of the smaller streets.

Mr. W. J. LIBERTY referred to the "centrally hung" lamps in the City of London mentioned by the author, and testified to their efficiency and effectiveness. He said, however, he could not agree with him that 30 feet was a proper height for such suspended lamps, for in Cheapside the electric lamps were fixed at a height of 27 ft. 6 in. and not 30 feet; those in Watling Street being the same height; while the high-power "Keith" gas-lamps at the eastern end of Cannon Street, put up by the Gaslight and Coke Company, were only 26 ft. 6 in. above the centre of the roadway, and those of the Charing Cross Electricity Supply Company, at the western end of Cannon Street, put up in 1907, were but 28 feet in height. At the average height at which the lamps were placed the best results were obtained, as was borne out by experience; and in Cheapside, the Oliver "Oriflamme" arc lamps, fitted with the "Peard" prismatic reflectors, which largely increased the horizontal rays, and allowed the lamps to be used with clear outer globes, and reduced glare at an angle of 30°, likewise made it possible to extinguish the side street lamps for a considerable distance. The same remarks applied to the high-power centrally-hung gas-lamps in Cannon Street, where the lamps, though without reflectors, had clear globes—the effect produced being both pleasing and practical; while as evidence of the economy of this form of lighting, he would mention that at the western end of Cannon Street (the Charing Cross Company's experiment) the extinguishing of the small lamps in the side streets had, it was stated, contributed 45 per cent. of the cost of the main road lighting, though to get this result some sacrifice had to be made in the matter of uniformity in spacing.

The CHAIRMAN (Mr. B. E. Dunbar Kilburn) proposed a vote of thanks to the author of the paper.

Mr. HAWKINS, in reply, said it was his hope that something definite might be the outcome of the paper with regard to the more uniform system of lighting in the streets of the Metropolis; the difference being so very apparent when walking from (say) the Bayswater Road to Oxford Street. With regard to private lighting, it was his firm opinion that the men who provided the light should consult the wishes of the users. With reference to Mr. Liberty's remarks, he should like to know what he meant by the high efficiency of the "centrally-hung" lamps; and with respect to the height of such lamps, he (the author) was of opinion that 30 feet was the proper distance.

Mr. LIBERTY replied that it was the "practical efficiency" of the centrally-hung lamps to which he referred, for suspending them in the centre of four cross roads, or an open space where sometimes more than four roads met, the lamp having the same illuminating power in each direction, enabled the lamps in each street to be extinguished for (say) 100 feet, according to the power of the central lamp. With further reference to the height of these lamps above the centre of the roadway, he was in favour of the shorter distance.

STEAM AND AIR IN GAS-PRODUCERS.

At a recent Meeting of the Institution of Mechanical Engineers, a paper on "The Effect of Varying Proportions of Air and Steam on a Gas-Producer" was read by Mr. E. A. ALLCUT.

The experiments recorded in the paper were performed in 1909 on a small gas-producer at the University of Birmingham. The chief object of the research was to determine the influence of varying quantities of steam on the general working and efficiency of small gas-producer plants. The air supply was kept as constant as possible, while the steam supply was increased from nothing to a maximum of 1·14 lbs. per pound of coal used. To avoid the complications and uncertainties of measurement which attend the presence of tar and volatile hydrocarbons, small anthracite coal was used in each trial. The steam was generated by a steam-coil inside the producer itself, and the air was blown into the closed ashpit by a fan. Steady conditions were thus obtainable throughout the trials; and it was hoped that they would clear up some of the uncertainty that seems to exist respecting the amount of steam necessary to give maximum efficiency and best all-round working in a gas-producer. Comparison between these results and those of Drs. Bone and Wheeler, in 1906,* on a 2500 H.P. Mond plant, should, moreover, throw light on the theory of gas production.

Having considered the reactions taking place in a gas-producer, the author described the plant used by him, which was constructed in the workshops of the Birmingham University, and the arrangements made for the trials. The producer was similar to those of the ordinary suction type, but was worked on the pressure principle; the air being blown into the closed ashpit by a fan. The steam was generated in an internal coil, and, joining the air in the ashpit, passed along with it through the grate into the fire. The internal diameter of the fire-brick lining was 10 inches, and the height of the fire from the grate to the bottom of the distributing cone was 25 inches. The object of using so small a producer was to enable it to be tested in four or five hours. The washer consisted of a cylindrical steel shell traversed by a shaft strung with thin discs, alternately pierced at the edge and centre; causing the gas to pass along the washer in a zig-zag direction. The lower half of each disc was immersed in water. The shaft was rotated at 76 revolutions per minute by an electric motor; and the gas, being continually swept into contact with the wet surface of the plates, was cooled and cleaned.

The air and gas were each measured by observing the difference in pressure at the two ends of a calibrated pipe; the temperature and pressure also being noted. The coal and water used were each observed by weight, and samples of both coal and gas were taken at regular intervals. At the end of each trial, the temperature of the producer was taken at the grate, and at intervals of 3 inches upwards from the grate to the top of the producer, by means of an electric resistance thermometer. The gas was analyzed in the special apparatus described in Professor F. W. Burstall's "Third Report to the Gas-Engine Research Committee;"† the calorific value of the coal was ascertained by combustion in a Mahler bomb calorimeter; and the moisture and ash in it were estimated. Efficiencies were calculated from the calorific value of the raw coal and the higher calorific value of the gas, and include the heat required to vaporize the water-feed.

The results of the experiments are tabulated, and also shown diagrammatically. It is seen from them that the percentage of hydrogen present in the gas ceases to rise with increasing amounts of water fed into the producer when the water-feed exceeds 0·75 lb. per pound of coal. This corresponds to the decomposition of 72 per cent. of the total weight of water fed into the producer. The maximum amount of steam that can be decomposed by anthracite at a temperature of 1832° Fahr. is about 0·535 lb. per pound of coal. The corresponding result obtained by Messrs. Bone and Wheeler is about 0·625 lb. of water per pound of coal. Consequently there is no advantage, but only loss, in raising the steam supply beyond 1·5 lbs. for large producers and 0·75 lb. for small ones. Excess of steam merely takes steam from the producer and loses it in the washer, besides reducing the temperature of the producer, and so yielding a poor gas. The author says the most significant result of the trials is that the percentage of carbon dioxide remained practically constant, in spite of the increasing feed of steam to the fire. The calorific value of the gas produced was low throughout, which was partly due to the low percentage of hydrogen resulting from the high ratio of air to steam used, and to the comparative absence of methane. The calorific value of the gas reached a maximum at a water-feed of 0·75 lb. per pound of coal; and as the maximum yield of gas also occurred at about this point, the highest efficiency of all is recorded at that feed.

The conclusion arrived at by the author as the result of his experiments is that the increased supply of steam beyond the point of maximum efficiency causes a decrease in efficiency proportional to the ratio of the oxygen in the steam to the oxygen in the air. This decrease, in the case of two producers, is the same for equal rises in the value of the ratio. Whether this also holds for other producers can, he says, only be determined by further investigation.

THE TESTING OF CREOSOTE.

A paper by Mr. C. EDWARD SAGE, F.I.C., on "The Testing of Creosote," was presented at a meeting of the London Section of the Society of Chemical Industry, held on the 1st inst. at the rooms of the Chemical Society, Burlington House, under the chairmanship of Mr. E. Grant Hooper.

The author remarked that samples of coal-tar creosote differed from one another because: Firstly, the method of carbonization or distillation of the coal differed slightly; secondly, because the descriptions of coal carbonized differed; and thirdly, because various methods were adopted for the distillation and working-up of the tar at tar-works. Notwithstanding the differences in creosote itself, he contended that there should be uniformity in the methods of testing of different samples. In the first place, the name "creosote" needed definition. His paper would refer to coal-tar creosote; and he would suggest that all specifications relating to it should be prefaced by the words "The creosote

* See "JOURNAL," Vol. XCVIII., p. 524. † *Ibid.*, Vol. CI., p. 175.

must be the product of the distillation of bituminous coal and free from admixture of other oils." There were many oils besides the creosote derived from gas-works tar which were used for mixing with creosote oil; and these should be excluded by a rigid specification. The essential points in testing creosote were the observation of (1) its physical condition; and (2) its approximate composition, and freedom from admixture with other oils. He would deal only with the most suitable standard methods of testing the creosote, and not with the specification to be adopted, which necessarily must vary according to requirements.

The sampling of creosote was a somewhat difficult matter. He suggested that the bulk should be liquefied and the sample drawn from the bulk. Three samples should be taken at the same time and sealed. Thus, if it were necessary to confirm the analytical results, a fresh sample would be available; and it would not be necessary to liquefy repeatedly the original sample for the purpose of division. The loss of naphthalene and other ingredients by repeated liquefying of a sample was responsible for many of the differences in the results obtained by analysts. Buyers should in all cases specify the method of sampling to be adopted.

The specific gravity was best taken at 60° C., at which temperature all ordinary samples of creosote were quite liquid; and the results should be corrected to refer to water at 60° Fahr. The determination was best made by means of the Westphal balance, or the specific gravity bottle. The coefficient of expansion of the oil was best determined by taking a definite measure in a flask at (say) 40° C., and noting the increase in volume when it was raised to 80° C. The mean coefficient of expansion between these temperatures might be taken to apply approximately to lower temperatures, though probably it was not strictly accurate. It was most convenient to transact dealings in creosote, if in small quantities, by weight, but if in larger quantities, it was more usual to measure the quantity by volume. The specific gravity being known, it was easy to transpose from weight to volume, or *vice versâ*, as required.

The determination of the flashing-point was often required for the purpose of fire insurance. The Abel test was commonly prescribed; but this test was unsuitable for oils flashing above about 150° Fahr. The Pensky-Marten testing apparatus was more suitable for the determination of the flashing-point of creosote oil. Commonly, the flashing-point was between 186° and 190° Fahr. In regard to the fluidity or condition of the creosote oil, it was not easy to determine the lowest temperature at which the oil remained fluid. The deposition of solid matter took place more quickly with some oils than with others at the same temperature. The determination of the solubility in benzol, which was sometimes made, was simple, except that the filtration of the extract was apt to be impeded if there were much water present in the oil. The maximum amount of insoluble matter permissible should be fixed at 0·25 per cent. If there were more than 1 per cent. of water present, it was necessary to make a preliminary distillation of the sample. The amount of water in creosote oil was ascertained by measuring the volume of water in the first fraction of the distillate. The approximate determination of naphthalene should be made in the fractions of the oil distilling below 270° C. and not on the whole oil. Mann had suggested a method of determination which he called "the latent heat point method." It appeared to the author to be applicable to similar oils, but not to oils of different origin.

The tar acids were best determined in the ordinary way by shaking out by 15 per cent. solution of caustic soda. It was important to determine the pyridine bases in the fractions distilling below 315° C. It was sufficient to shake them out with acid. The determination of the viscosity of creosote oil had no practical value. The distillation test of creosote oil was that which caused the most disagreement among analysts. The author had been engaged in 1902 and subsequent years in careful investigation of this test. When dealing with wood-tar and blast-furnace creosote, he preferred to use a Wurtz flask. For uniform results with coal-tar creosote, he had found that retorts were best. They must be of hard glass. The position of the thermometer was of great importance. He used an asbestos-covered retort with the thermometer with its bulb dipping in the liquid. It was most important that analysts should use similar thermometers for this work; and those which were generally adopted were graduated from 170° to 360° C. The distillation test showed the relative proportions of water and oils collected at different recognized temperatures—usually 170° C., 220° C., 245° C., 270° C., and 315° C. The residue left on distillation should not contain much high-boiling constituents if it were to enter the timber freely. In the United States, petroleum products were commonly added to creosote, but in this country there was not much opportunity for such adulteration. The sulphonation test was carried out in the United States mainly with the object of determining the petroleum in the fractions. When applied to London creosotes, the amount found by this test ranged from 0·05 to 0·2 per cent. The results were slightly higher with Midland creosotes; and with blast-furnace creosotes, they ranged from 0·3 per cent. to as much as 4·6 per cent. The refractive index afforded a valuable criterion of the composition of the tar oils. It ranged from 1·48 to 1·54 for blast-furnace creosote oils, and from 1·57 to 1·63 for coal-tar oils. For petroleum, it was about 1·47 to 1·48. The method of distillation of the oil, however, made a great difference in the refractive index. When the oil was distilled from an 8-oz. retort, the fraction distilling above 315° C. should have a refractive index above 1·60 if the oil was a genuine coal-tar creosote.

In regard to the germicidal value of creosotes, it might be pointed out that London creosote had nearly twice the value of carbolic acid. Even the portion of creosote oil not distilling below 315° C. contained important phenolic constituents. It might be predicted that a biological test of the germicidal value of creosote would be needed in the near future.

[After presenting his paper, Mr. Sage showed some diagrams on the screen illustrating certain of the points that he had dealt with in it.]

The discussion on the paper was opened by Mr. Blagden, who said that, although the paper introduced some controversial matter, it was likely to prove very valuable to those concerned with the analysis and sale of creosote oil. He considered that a reliable test was required for the presence of blast-furnace oil in creosote, and he would be glad to know if the author considered that the determination of the refractive index of the fraction or residue was sufficient indication of the admixture of blast-furnace creosote with coal-tar creosote.

Dr. Lewkowitsch said that the author had laid great stress upon the examination of creosote oil for naphthalene, but he wondered why this was so. He had always understood that the tar acids were the most important constituents of creosote. In regard to the refractive index test, he was of opinion that the refractometer was relied upon to too great an extent, in so far as mixtures were concerned. He also was of opinion that it was scientifically much more correct to observe the temperatures with the bulb of the thermometer in the vapour instead of in the liquid as the author favoured.

Mr. W. J. A. Butterfield said that he quite agreed with Dr. Lewkowitsch that it was better to have the bulb of the thermometer in the vapour than in the liquid. In comparative tests in which he had had two thermometers—one with its bulb in the vapour, and one with its bulb in the liquid—he had found with such products that the thermometer in the liquid might run up as much as 200° C. in a comparatively short time, during which the thermometer in the vapour rose perhaps only some 30° C. In regard to the author's proposition that the specific gravity should be taken uniformly at 60° C., he deprecated the adoption of such a plan in cases where the oil was free from solid matter or crystals of naphthalene at a considerably lower temperature. There were other uses for creosote oil beside that of creosoting timber—as, for instance, the use of oil for extracting naphthalene from gas, and for thinning pitch for road construction; and the specifications in such cases would differ materially from those for oil for creosoting timber. In one such specification issued by a Government Department, he believed that the oil was required to be free from solid matter when maintained for half-an-hour at 20° C., and the specific gravity in this case was to be taken at the same temperature. It would be inconvenient and unreasonable with such an oil to require the specific gravity to be taken at 60° C. In regard to admixture of blast-furnace creosote, he believed that the most reliable means of detection was a careful fractionation and observation of the specific gravity of the fractions.

Mr. E. Grant Hooper, the Chairman, remarked that, in regard to creosote specifications, a great advance had now been made on the stereotyped specification which was ordinarily ascribed to Dr. Tidy. It was, he believed, no longer held that the tar acids were the most essential constituents of creosote for saturating timber. He thought the best criterion of the value of creosote for such purposes was the prescription of a maximum amount of solid matter—viz., the residue remaining undistilled at 315° C. *plus* the naphthalene collected. The most convenient temperature for taking the specific gravity of creosote oil was that commonly adopted for other materials—viz., 60° Fahr. In his experience, creosote, as soon as the solid matter had been melted, took some considerable time before solid matter again settled out, and the specific gravity could then be taken at 60° Fahr. without difficulty. In regard to the sample, it was, in his experience, sufficient to leave it overnight in order to obtain uniformity. But this only applied to small samples; and there was a radical disadvantage in the handling of bigger quantities. If the coefficient of expansion was of importance, he thought the author's proposals for determining it were quite reasonable. As to the flash-point determination, he believed that though the Abel test was commonly prescribed, it was understood that at the higher temperatures the Pensky-Marten test, which was substantially the same as the Abel, was intended to be used. In regard to the determination of solid matter in creosote, there was from three-tenths to five-tenths of 1 per cent. of normal creosote insoluble in alcohol. It was easy to observe, by the behaviour of the liquefied sample, whether it contained much insoluble matter. The liquefied sample should not cling to the containing vessel. An inferior sample would contain from 2 to 4 per cent., or even as much in rare cases as 16 per cent., of matter insoluble in alcohol. The determination of naphthalene was easily made by cooling to −10° C. and filtering. If the sample contained much naphthalene, it was necessary to effect the cooling and filtration in two stages. It was a question, however, how much the naphthalene so determined represented of the total napthalene in the sample, and the proportion depended on the character of the constituent oils. The better way was to make a true determination of the amount of naphthalene in the sample by treating a portion with glacial acetic acid, and determining the naphthalene as picrate.

The Chairman's remarks closed the discussion, and the author replied quite briefly to the points raised.

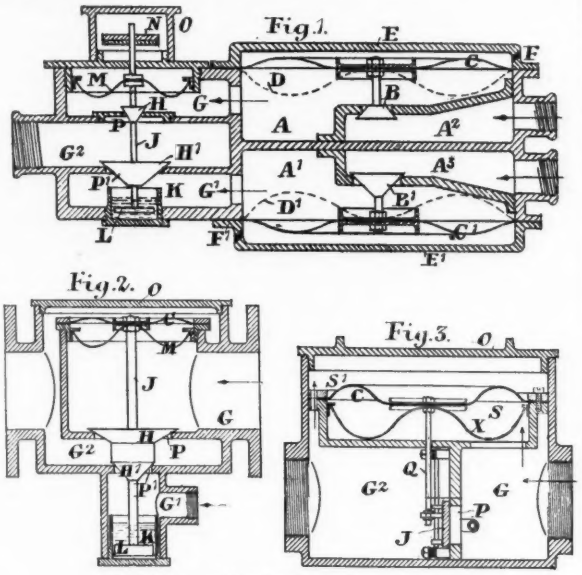
REGISTER OF PATENTS.

Proportional Valve for Mixing Fluids.

THORP, T., F., & H. T., of Whitefield, Lancs.

No. 5891; March 9, 1910.

This invention has for its object to maintain "a predetermined proportional mixture and pressure of two or more fluids, and to enable the proportions and pressure of the fluids to be varied at will . . . so that, after setting, the proportions and pressure will remain constant irrespective of the volume passing through the apparatus."



Thorp's Proportional Valves for Mixing Gases.

Fig. 1 shows one form of the apparatus, in which the governors and proportional valve are in close connection. It consists of two distinct portions—the governing devices and the proportional valves, &c. The proportional valve consists of three chambers G, G^1, G^{II}; the two former being inlet chambers and the last a common outlet chamber. H H^1 are two valves on a common spindle J. K is a dash-pot, in which a disc L moves. M is an "anti-spring*;" N, a platform on which weights can be placed; and O, a cover. P P^1 are orifices of the valve seatings, and are proportioned so that the desired mixture can be obtained; and the valves H H^1 are proportioned and shaped to pass relative proportions no matter what may be the positions of the valves.

The proportional valve lifts from its seating by reason of the pressure in the chamber G^1 acting on the valve H^1. The pressure at the outlet—*i.e.*, in the chamber G^{II}—is the difference between the pressure in the chamber G^1 less that absorbed by the passage of the gas through the valve openings, and which absorption is due to the weight of the whole valve *plus* the pressure produced by the anti-spring M and the pressure on the valve H. This pressure can be varied at will by altering the weight on the spindle. If it is desired to alter the proportions of the two gases, the pressure of the gas to the inlet of the proportional valve must be varied.

The pressure on any inlet should never be such as to cause the pressure of the mixture to be in excess of any other inlet pressure; or the pressure of the mixture will overcome the flow of the gas on the low-pressure inlet, and so gas from one supply will pass into the other supply.

Fig. 2 shows the proportional valve with the governed supplies in close connection with the proportional valve. The main features of the invention, as shown in fig. 1, are retained; but a diaphragm is used in connection with the anti-spring on the spindle of the proportional valve. G G^1 are the chambers for separate gases, while G^{II} is the chamber for the mixture. J is the spindle common to the two valves H H^1, while P P^1 are valve openings. M is the anti-spring; C, the diaphragm; K, the dash-pot; and L, the disc attached to the spindle J, which moves in the dash-pot. The cover O closes the chamber G^{II}, but can be removed for examination and for taking out the proportional valve, or for varying the pressure of the mixture.

Here the pressure of the gas in the chamber G acts on the diaphragm C, and lifts the proportional valve. The area of the diaphragm being greatly in excess of the area of the valves H H^1, the action of the pressure on the two valves can be neglected for the purpose of description. The diaphragm which is in connection with the anti-spring having the pressure of the inlet gas in the chamber G on one side and the pressure of the outlet gas in the chamber G^{II} on the other side, will work upon the difference between the two pressures. If the pressures in G and G^1 are kept constant and the weight on the diaphragm C is constant, then the pressures in the chamber G^{II} will remain constant irrespective of the volume passing.

The mixture remains constant, as the valves and orifices are so proportioned that, being on a common spindle and having the same movement, the same relative proportion passes each valve no matter what the position of the spindle may be. The proportions may be varied *in situ* by altering the inlet pressures as described for fig. 1, while the pressure of the mixture can be varied by altering the weight on the diaphragm C or by similar means to those described concerning fig. 1 for altering the pressure of the governors.

In fig. 3, the invention is shown with a slide-valve used in place of the conical valves shown in fig. 2. This could obviously be a cylindrical reciprocating valve or a piston valve in place of the flat slide-form shown. G G^1 are the inlet chambers to which the separate gases at governed pressures are conveyed. These chambers are separate from each other to lead to a common outlet chamber G^{II} through the ports P P^1. These ports are closed by a slide-valve J. When the valve is actuated, it uncovers the ports P P^1 simultaneously according to the volumes required. The width of the port P can be varied, as one edge of it is made by an adjustable slide to which is attached an adjusting screw passing to the outside. Whenever necessary, both ports are made adjustable. The slide-valve moves along two guiding rods to which are attached springs, so that the slide-valve is pressed against the face of the ports, thus making a tight joint. To the slide-valve J is attached the connecting rod Q, actuated by the diaphragm C and anti-spring X. The cover O closes the chamber G^{II}, but can be removed for examination of the diaphragm and valves.

* This is a term explained in the specification of patent No. 5791 of 1905.

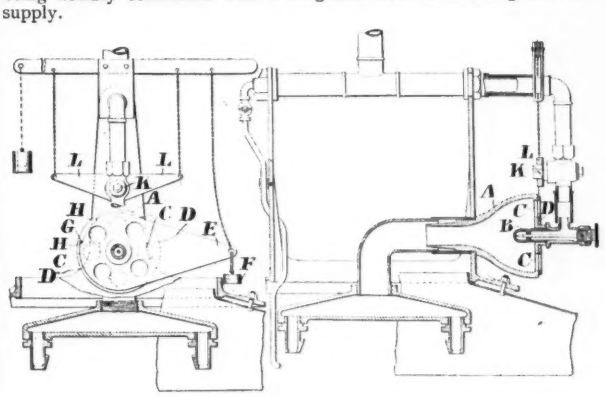
Incandescent Gas Lighting and Heating.

CUSS, C. T., of Swindon.

No. 6250; March 12, 1910.

This invention has for its object to provide means for avoiding shock to mantles on igniting and extinguishing the burners, and also to reduce the resistance through the burner so that sufficient air for efficient combustion of gas at very low pressure can be obtained.

The form of burner employed has controlling devices by which the gas is admitted before the air on igniting, and the air is cut off before the gas on extinguishing; the burners being constructed with injector nozzles of smaller diameter than usual, and all gauzes being dispensed with. The devices controlling the air supply to the bunsen tube are flexibly connected to the lever which controls the gas supply; so that the gas can be turned on before the air is admitted on ignition and the air cut off before the gas is cut off on extinction of the light. The gas supply is controlled by a cock operated by a lever connected to a second weighted lever overhung, so that, on being operated, it moves through its full movement in either direction; the gas controlling lever being flexibly connected with a weighted lever controlling the air supply.



Cuss's Incandescent Gas-Burner.

In the apparatus illustrated, the inner burner is provided with a modified bunsen, the portion of which A into which the injector nozzle B projects being conical. Perforations C are provided in the larger or outer end of the injector cone, to be opened or closed by a disc valve D, which is perforated, so that when opened air passes through it to be mixed with the gas from the injector nozzle. The disc is operated by an arm E, provided with a weight F to keep the disc valve normally closed. A stop G limits the movements of the valve and its arm by engagement with shoulders H formed in the disc or the arm which operates it. The gas-valve K is operated by a lever L connected by chains with an overhung lever by which the valves are operated. The arm E of the air controlling disc is connected to one end of the lever, and is so arranged that, when moved in the direction to turn on the gas, a certain movement of the lever and the gas-valve takes place before the movement of the arm E. The continued movement of the lever operates the air controlling disc and admits air to the burner. On closing the gas-cock, the arm of the disc valve falls by gravity, due to the action of the weight F, and closes the air apertures before the gas is cut off—thereby permitting the light to be extinguished without shock.

Spirally-Guided Gasholders.

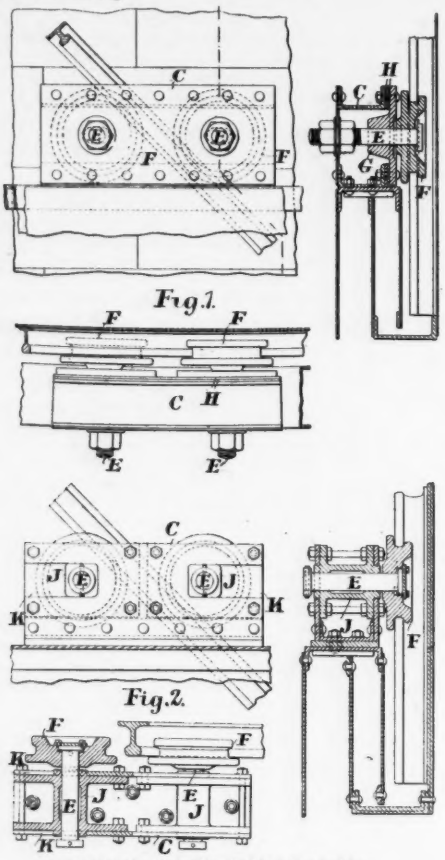
WRIGHT, H. F., of Newport, Salop.

No. 8543; April 8, 1910.

This invention relates to gasholders, the lifts of which have guide-rollers which run upon spirally arranged guides; the object being to provide a construction of carriage for the rollers and means for adjusting the rollers relatively to the holder "in either a radial direction or a horizontal circumferential direction, so that they shall be adaptable to various sections of spiral guides and properly coincide with the position of the spiral guides."

The bearings for the roller spindles are independent of the carriage, and can be adjusted independently of the carriage by the insertion of packing plates between the bearing carrying the spindle and the framing of the carriage—the nuts on the spindles for securing the latter being correspondingly adjusted relatively to the plate of the framing of

the carriage through which the rear ends of the spindles pass. In order to provide for the circumferential adjustment of the rollers, the bearings carrying the roller spindles can be adapted to slide by elongating the holes in the carriage.



Wright's Spirally-Guided Gasholder.

Fig. 1 shows a front view of the carriage in conjunction with the spiral guides; also a plan and section on the line X. Fig. 2 shows a modification for effecting the adjustment of the guide-rollers in the circumferential direction of the gasholder.

In fig. 1, the guide-rollers F rotate upon the spindles E. To effect the adjustment of the rollers in a radial direction relatively to the holder, provision is made for inserting packing pieces H between the front plate and the other portions of the carriage. Where the spindle is fixed, nuts on the rear end of the latter are adapted to be loosened, so as to allow of the adjustment of the spindles to the desired extent in the bearings G; the nuts being then tightened up against the rear-framing of the carriage. The adjustment of the roller in the circumferential direction of the holder is provided for by elongating the holes in the front plate of the carriage C, through which the fixing bolts pass, and also the holes in the rear plate of the carriage, through which the spindles E pass (as indicated by the dotted lines), so as to permit of a certain amount of lateral movement being imparted to the spindles.

The patentee prefers to provide for the circumferential or lateral adjustment, as in fig. 2, where the spindles E are carried in bearings J, which are adjustable in a lateral or circumferential direction between the front and the rear plates of the carriage; these plates being slotted as at K, and the holes in the carriage or in the lugs of the bearings through which the fixing bolts pass elongated so as to allow of the bearings J being adjusted in the carriages, or bodily removed with the spindles and rollers after removing the bolts.

Subjecting Gases or Vapours to the Action of Liquids.

FELD, W., of Hoenningen-on-the-Rhine, Germany.

No. 8875; April 12, 1910.

This invention relates to apparatus for subjecting gases or vapours to the action of liquids, of the kind in which a vessel or vessels is or are employed, each containing a rotatable device comprising a funnel or short conical pipe (as described in patent No. 15,683 of 1908) and short conical pipes dipping into the liquid in the vessel and extending above the liquid, so that, on their rotation, they will, under centrifugal action, elevate the liquid and distribute it in the form of spray across the whole of the space through which the gases or vapours pass.

The arrangement was described and illustrated (from the French specification of the invention) in the "JOURNAL" for March 11, p. 838.

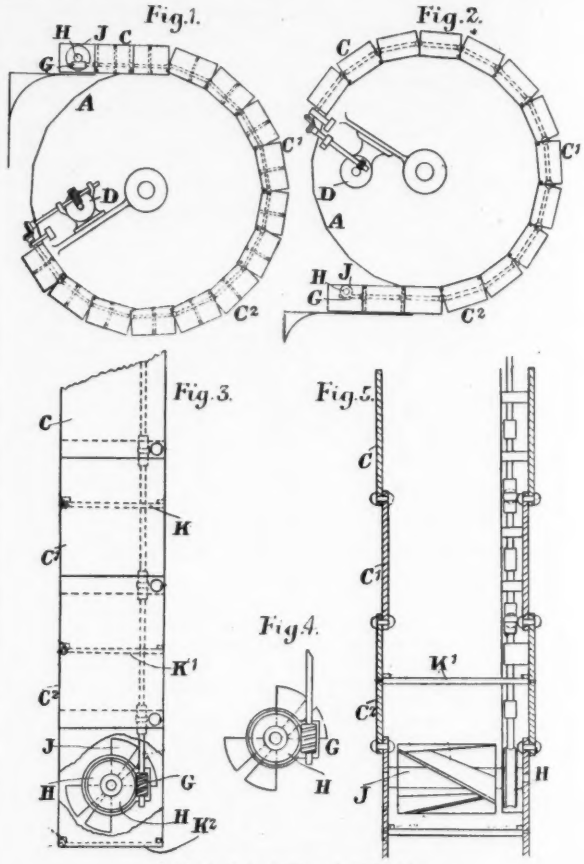
Retort-Charging Machine.

ASHLEY, T. J., of Bath.

No. 9242; April 16, 1910.

In certain of the mechanical stokers in use, the patentee mentions the method of introducing the coal has been as follows: A series of vertical steel plates are arranged parallel to each other and linked so as to form a chain, which works over or around a chain-wheel of polygonal or other suitable form. Working between the vertical plates, and hinged as high as possible consistent with the size of the retort, are push-plates. The defect in this method of charging a retort is, the patentee declares, that, on the withdrawal of the chain, a certain amount of space has to be left for the clearance of the plates, and part of the retort remains uncharged. Consequently, the capacity of the retort is not utilized to its fullest extent. The friction of the plates upon the coal also withdraws a certain amount from the retort.

His invention has for its object to utilize the space in the retort which has hitherto been wasted, and also to give a more efficient distribution of the coal in the retort. It consists of a rotary spade or shovel, connected to the end of the chain, which is caused to rotate by means of a flexible shaft connected to a motor, so that as the chain is being withdrawn from the retort the rotary spade acts upon the coal being withdrawn and throws it forward, so as to fill up the void space to the greatest advantage.



Ashley's Retort-Charging Machine.

Fig. 1 is a side elevation of the chain-wheel and chain, showing how the motor may be arranged and connected to a flexible shaft, and showing the chain as charging the retort from the upper side of the chain-wheel. Fig. 2 shows the same arrangement as fig. 1, but with the chain charging from the lower side of the chain-wheel. Fig. 3 is a side elevation of a portion of the chain, showing how the links are pivoted or hinged and the arrangement of the push-plates. Fig. 4 is an end elevation of the rotary spade, showing two blades with a right-hand spiral or twist and two left-hand. Fig. 5 is a plan of a portion of the chain, showing the flexible shaft, worm-wheel, rotary spade, and push-plates.

Assuming that the retort is open and that the chain is in position ready for charging, the wheel A is caused to rotate by any suitable means, and the chain C is filled with coal from a hopper or shoot, and is forced into the retort, displacing the coke from the last charge through the back opening. The pressure due to this operation is borne by the push-plates K, K^1, K^2. When the chain reaches into the retort as far as is required, the motion of the wheel is reversed, and the chain commences to withdraw from the retort. The motor D is then set in motion; and, through the medium of the gears and the flexible shaft shown and the worm and wheel G H, it rotates the spade J, and as the chain is withdrawn, the blades of it act upon the coal and impels it forward—thus filling the void space in the retort.

Provision may or may not be made for depositing coal upon an enclosed platform or channel outside the retort, so that after the spade is withdrawn it is still injecting coal into the retort; and, if required, more coal can be added to the platform to feed the spade if the amount supplied is insufficient to fully charge the retort.

Heating Vertical Retorts.

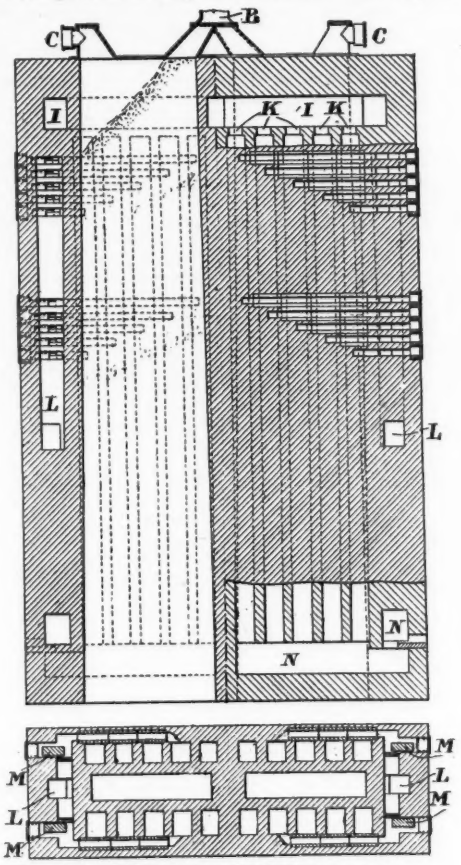
WOODALL, H. W., of Lytchett Matravers, Dorset, and DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 9494; April 19, 1910.

This invention relates to the heating of vertical retorts (in which the major axis considerably exceeds the minor) charged with coal from a shoot, at one point along the major axis. The coal is separated by gravity into various sizes—the larger pieces falling to the side farther

from the charging shoot, and the smaller pieces filling the retort directly under the charging device. In consequence of this, the patentees point out, it has been found that the gas travels up the portion of the charge which is composed of the larger pieces, and also that it is detrimental to heat these gases highly as they pass through the charge from the retort.

According to the present invention, the retort is heated by vertical flues in such a manner that the flues immediately adjacent to the part of the charge through which the gas passes are heated to a lower temperature than where the charge is composed of the smaller pieces of coal. In this way, "the gas is not decomposed, and, furthermore, the denser part of the charge receives the greater amount of heat it requires."



Woodall and Duckham's Vertical Retort Furnaces.

A mode of applying the invention to two continuously operated retorts is shown in vertical and horizontal section.

The retorts are fed from a hopper B common to both; the feed being at one end of the longer axis of each retort, so that the coal sorts itself in the manner already referred to. The gas is taken off at C. Each retort is heated by five vertical flues on each side. The gas-flue I runs along each side of the top of the retort; and gas is admitted to the upper ends of the vertical flues through ports K. As it is desirable that the lower part of the charge shall be more highly heated than the upper part, the air for combustion is admitted into each flue in two portions. Thus there are two sets of air-ports. In the flue next to the portion of the retort where the more finely-divided coal is, the air-port is immediately below the gas-port K, and the other air-ports are successively at lower levels, so that combustion begins in each flue at a lower level from the centre. Below the level of these ports is the second set of ports, which have a like relationship to each other. The several flues leading to these air-ports are branches from a common air-flue L, and each is controllable by its own damper M.

These dampers are so adjusted that the desired gradations of temperature are obtained; the proportion of the air admitted through the upper set of ports being generally insufficient for complete combustion, so that the temperature of the upper part of the charge may not be so high as that of the lower part. At the bottom, the vertical flues open into a common flue N leading to the chimney.

Self-Igniting Incandescent Mantles.

EISNER, A., of Berlin.

No. 11,230; May 6, 1910.

This invention relates to mantles, wherein a catalytic-acting igniting pellet of platinum-black or the like, with igniting stripes extending over the mantle, serves as igniter. The known preparation of such igniting pellets and igniting stripes on the mantle has, the patentee asserts, proved to be inadequate, "as the self-ignition does not properly act, or even fails to act, in damp or foggy weather." To obviate this drawback, he proposes a special preparation both of the pellet and the igniting stripes.

Owing to the effect of the lighting gas, the preliminary heating effect that is transmitted to the igniting stripes and starts the ignition proceeds from the pellet proper, which may be provided on any part of the mantle for ordinary or inverted incandescent gaslights. It is distinguished for its peculiar composition in that it is prepared from an intimate combination of glycerine with oxides or salts of the rare metals of the earth (cerium, lanthanium, didymum, &c.) and with preparations of metals of the platinum group (platinum, iridium, rhodium, &c.). Certain glycerides of the rare metals of the earth in combination with reduced platinum, iridium, &c., therefore appear on the finished pellet as active substances, whereby the alleged effect is attained, because as soon as the gas comes in contact with the pellet, the state of incandescence is ensured, even in damp weather. The preliminary heating effect is transmitted to the igniting stripes, which proceed from the pellet as their starting point and effect the ignition proper.

The impregnating substance of the igniting stripes consists of an intimate combination of constituents (such as platinum, iridium, rhodium) of the platinum group and a neutral salt; one part of the platinum group and one part of the neutral salt, such as Glauber's salt, chloride of potassium, &c., being dissolved separately and then intimately mixed. These igniting stripes are also said not to be affected by the humidity of the atmosphere.

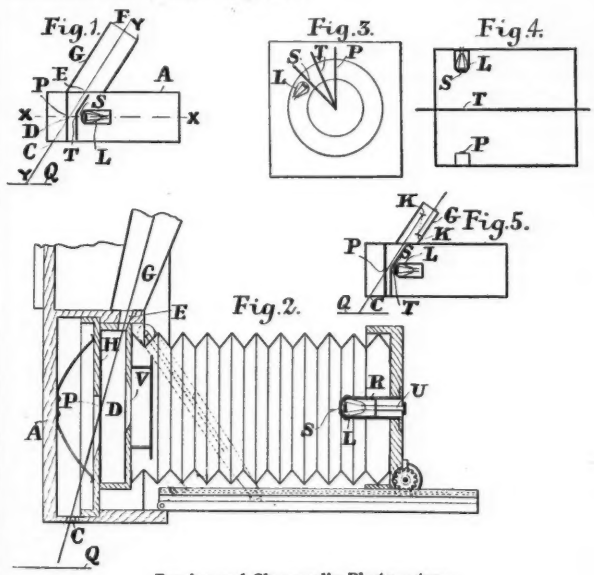
Photometers.

TREZISE, J. M. G., and SHEPPARD, W. J., of Putney, S.W.

No. 15,408; June 27, 1910.

In carrying this invention into effect, the patentees propose to employ a photometer screen of small dimensions, and bring the photometer light, the exposed illuminating surface of which is also small, very much nearer to the screen than is usual. By this means, by moving the photometer light nearer to, or further from, the screen as may be required to balance the surface brilliancy to be measured, they obtain an instrument of large range with small movement. For instance, a range of about 2500 can be obtained by a movement of the photometer light within the distances of 0·02 and 1 foot from the photometer screen.

By the introduction of a partially obscured, translucent, or diffusing screen between the photometer light and the photometer screen, the range may be further increased. For instance, if, when the translucent screen is 0·02 foot from the photometer screen and the photometer light is 0·02 foot from the translucent screen, the translucent screen and the photometer light, their positions relative to each other remaining the same, are together moved to a position in which the translucent screen is 1 foot from the photometer screen, the range given by this movement will be about 2500. The translucent screen remaining in this position, if the photometer light be now moved to a position 1 foot from the translucent screen, the range given by this further movement will be again about 2500. That is, the total range obtained by the combined movements will be about 6,250,000.



Trezise and Sheppard's Photometers.

The introduction of the translucent screen enables the instrument to be readily calibrated by the use of an ordinary standard of light. For instance, if when the translucent screen is 0·02 foot from the photometer screen and the photometer light is 0·02 foot from the translucent screen the surface brilliancy of the photometer screen is too great to be compared with the brilliancy of a surface illuminated by an ordinary standard of light, it may be reduced to measurable quantities by movements of the photometer light to suitable distances from the translucent screen. Then, if the translucent screen and the photometer light are together moved along the scale of the instrument, the brilliancy of the photometer screen can be compared with the brilliancy of a surface illuminated by an ordinary standard of light. A number of measurements may thus be taken and marked off on a scale of the distance of the translucent screen from the photometer screen; and if the exposed surface of the photometer light is similar to the exposed surface of the translucent screen, the scale of the distances of the photometer light from the translucent screen may be similarly divided, and the calibration throughout the whole range of the instrument can be obtained. It will be seen therefore that the instrument can be calibrated throughout its whole range even if the surface brilliancy of the photometer screen does not vary inversely as the square of the distance of the translucent screen from it. Accurate measurements of very high or very low degrees of brilliancy, it is claimed, may thus be made.

The photometer screen may consist of a sheet of metal or other opaque substance with an aperture in it partially filled by an opaque

material with a white surface, or a translucent material illuminated by the photometer light, or of cardboard, celluloid, or like substance, or of translucent material with an aperture in it similarly arranged—the observer looking through the aperture at the surface the brilliancy of which is required to be measured. The observer uses one or both eyes, which may be shaded from extraneous light.

Fig. 1 is a diagrammatic view of a suitable general apparatus, in which the photometer light and two translucent screens move in a straight path perpendicular to the photometer screen. Fig. 2 is a side sectional elevation of an instrument of smaller range, in which the photometer light and a single translucent screen also move in a straight path. Fig. 3 is a diagrammatic view of an apparatus in which the photometer light and the two translucent screens move in a curved path. Fig. 4 is an apparatus in which the photometer light and the two translucent screens move in a straight path parallel to the photometer screen. Fig. 5 is an apparatus similar to fig. 1, but in which mirrors, the reflecting surfaces of which are dark, are employed to reduce the surface brilliancy visible to the observer.

In fig. 1, the photometer box A is shown of a size convenient to hold in the hand; P is the photometer screen; T, the second movable translucent screen; and S, the first movable translucent screen employed to control the exposed illuminating surface of the photometer light. The path of the photometer light X and the translucent screens is *x x*; G is a chamber attached to the photometer box with an open end at F; the box having also an opening E. Through G the observer looks at the photometer screen P. The screen has an opening D in it, whereby the observer, looking along the line *y—y* through an aperture C in the bottom of the box, can simultaneously view a surface Q, the brilliancy of which is required to be measured.

In making a measurement of high illumination, the photometer light L and the translucent screen T are kept close together in the first position; and balance is obtained by moving them together until the brilliancy of the surface of the screen T illuminated by the light equals the brilliancy of the surface under observation as seen through the aperture D in the photometer screen.

By this means, a range of about 2500 is obtained by a combined movement of the photometer light and the translucent screen T within a distance of 0·02 foot and 1 foot from the photometer screen.

If illumination of a lower degree than can be obtained by this means is required, the intensity of the illumination of the photometer screen can be reduced by convenient stages to about 1—2500 by a combined movement of the photometer light and translucent screen S from the translucent screen T within the distances of 0·02 and 1 foot apart; and the photometer light translucent screen S and the translucent screen T can be moved together to obtain a balance. By these combined movements, a total range of about 6,250,000 (as stated) is obtained.

In this instrument, the intensity of the illumination by the photometer light is based upon the law of inverse squares.

Fig. 2 shows a portable apparatus of smaller range in which the translucent screen T of fig. 1 is omitted, and the range of movement of the photometer light L from the screen S is but small. The light in a suitable case is shown enclosed in a tube R, in which it is slidable by means of a handle U; while the support of the screen S forms a cap for the tube R. The calibration of this apparatus between the screen S and the light is determined experimentally. Diaphragms or stops (of which one is shown at V) are provided to prevent diffused light from the sides of the apparatus reaching the photometer screen P, which, as in fig. 1, may consist of a semi-elliptical white or coloured surface in juxtaposition to an aperture D of similar size and shape, so arranged that when viewed through the chamber G the two together appear as a circle; the photometer screen P being illuminated by the photometer light, and the aperture showing the brilliancy of the surface Q required to be measured. The screen P and aperture D are in the centre of an opaque supporting screen H, the surface of which is blackened.

In this form of instrument, when a sufficient range is obtained from the combined movement of the translucent screen S and photometer light (the distance between the translucent screen and photometer light remaining constant), the instrument may be standardized by bringing the photometer light nearer to, or further from, the translucent screen; and this method may be employed to compensate for any variation of the photometer light from any cause. This method of standardization or adjustment may be employed in any of the forms of instrument under this invention.

It will be seen that the single screen S acts in the case of fig. 2 not only for the above purpose, but also to reduce the size of the exposed surface of the light, and also to localize the light; thus enabling it to be approached very near to the photometer screen, and to increase the range of the apparatus within the limit possible by varying the distance between it and the photometer screen.

In fig. 3, the photometer light, which also has a screen S, and the translucent screen T move in a curved or circular path round the same centre. As the angle of incidence varies on account of the curvature of the path, the calibration is based upon a combination of the law of inverse squares and the law of cosines. In this form of apparatus, a more equal scale is obtained. At the beginning of the path from the photometer screen P, the diminution of the illumination following the law of inverse squares is great, and that of cosines small, as the movements approach 180 degrees diminution due to the law of inverse squares is less and that of cosines greater. The method of using the apparatus would be the same as for fig. 1.

Fig. 4 is an apparatus in which the photometer light and screen S and the translucent screen T move in a straight path parallel to the photometer screen P. The calibration is based upon a combination of the law of inverse squares and the law of cosines. As in the previous instruments, the photometer light and the translucent screen T can move independently of each other or together. In this figure, a straight path parallel to the screen P is indicated, but the path could obviously be diagonal.

Fig. 5 shows an apparatus similar to fig. 1, where the observing chamber G is provided with two mirrors K, the reflecting surfaces of which are darkened, so that the intensity of the surface brilliancy visible to the observer is reduced to a convenient extent. These mirrors are also used to facilitate the comparison of lights of different colours. Where the screen T is employed, adjustment for the light L in relation to a screen S in a tube or the like R may be provided for standardizing as stated.

Concluding their long specification, the patentees say: The photometer screen may be of opaque material without an aperture, and the observer may make the comparison by looking through an aperture in a screen the brilliancy of which it is required to measure, or by other known means. But in most cases, for ordinary work, where accurate results are required, the arrangement first described is preferred, as in it the observer's eyes may be conveniently shaded from extraneous light; and, further, it has the advantage that the result is not affected by the close proximity of the observer to the surface under examination—such proximity for ordinary work not being necessary.

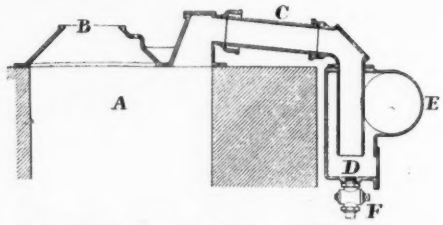
Delivery of Volatile Products from Gas-Retorts.

DUCKHAM, A. M'D., of Little Bookham, Surrey.

No. 16,631; July 12, 1910.

In a bench of gas-retorts, coke-ovens, or the like, the patentee remarks, the pipes delivering the distillation products from the retorts generally open into a common foul main; and when it is undesirable that the dip-pipes should be constantly sealed by liquor in the main, some provision is necessary for sealing the delivery pipe of any retort which may be for the time being out of operation.

According to the present invention, a separate seal-pot is provided for each delivery pipe, and is placed at a lower level than the foul main; so that liquor condensing in the latter can flow into the pot and seal the end of the delivery pipe extending into it. The seal-pot has an outlet at its lower part controlled by a valve. So long as the retort is in operation, this valve remains open, so that liquor running into the pot from the foul main can flow away, leaving the delivery pipe unsealed. When, however, the retort is put out of operation, the valve is closed, whereupon liquid flowing into the pot from the foul main collects in it and seals the delivery pipe.



Duckham's Seal-Pot for Vertical Retort Mains.

The invention is particularly applicable to vertical retorts; and the delivery pipe is preferably a descension pipe in contradistinction to the usual ascension pipe. This overcomes sundry disadvantages inherent in the latter, and also permits the admission of liquid (ammoniacal liquor) at a suitable point in the pipe for the purpose of washing away accumulations of tar. The liquor thus flowing down the pipe passes away through the valve so long as the retort is in operation; but when the valve is shut, the liquor accumulates in the seal-pot until it arrives at the level of the foul main, along which it then flows to the next seal-pot having an open valve. In this manner, the delivery pipe is more quickly sealed than when liquor flowing from the foul main is relied upon for the purpose.

In the illustration of this invention as applied to a bench of vertical gas-retorts, A is one of the retorts, B the charging opening, and C the descension pipe which terminates in a seal-pot D. This pot is cast with a lateral cylindrical portion E forming a union for attachment of lengths of pipe connecting the several seal-pots and constituting the foul-main.

When the retort is in operation, the cock F is open; and liquor running into the seal-pot flows away to the collecting tank. After closing the cock, the descension pipe speedily becomes sealed by the liquor; or if more rapid sealing is required, liquor may be introduced through a cock (not shown) at some convenient point in the descension pipe.

Lighting and Extinguishing Gas-Lamps by Variation of Pressure.

DEUTSCHE GASGLÜHLICHT AKTIENGESELLSCHAFT (AUERGESELLSCHAFT), of Berlin.

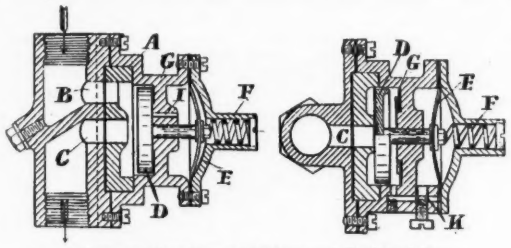
No. 18,918; Aug. 11, 1910. Date claimed under International Convention, Dec. 15, 1909.

In apparatus for lighting and extinguishing gas-lamps in which the valves that effect these operations are actuated by a membrane, when the principal flame is burning at the higher pressure, the membrane is kept bulged out, and in course of time stretches more and more. The consequence is that valves for setting the apparatus no longer move to their extreme positions for opening and closing, and the lighting device fails to act. Moreover, the membrane, being stretched more and more, will become pervious to gas. The inventors therefore arrange that the membrane or diaphragm will be freed from the high pressure while the principal flame is burning.

In the casing of the apparatus (p. 461), into which open the gas inlet B and the outlet C, a movable valve D, connected with the membrane or diaphragm E, is movably mounted. Between D and E, a partition G is provided, against which the valve can bear when the membrane is actuated by the increasing pressure of the gas. A spring F, acting on the other side of the membrane, tends to bring the valve back into the closed position.

In the position of rest (fig. 2), the valve closes the outlet C. If the

pressure at B is increased, it will also increase in the casing of the lighting apparatus, and, by the passage I in the partition, reach the membrane, so as to deflect it towards the right. The valve is thus raised off the seating of the outlet C, and the gas exit to the principal flame is freed. While this is taking place, gas passes through the channel I to the feed of the pilot-flame K, so that on the increase of pressure the pilot-flame is lengthened and lights the principal flame.



A German Gas-Lamp Lighter and Extinguisher.

On a further increase of the pressure, the valve A approaches the partition G; so that the distance between the valve and the partition is constantly reduced. By reason of gas flowing out of the pilot-flame feed into the atmosphere, a difference of pressure is produced between the chambers at the two sides of the partition which forces the valve D against the partition, so that the space between the membrane and the partition is closed against further admission of gas, and the membrane is thus relieved. When the pressure of gas in the supply diminishes, and also that acting upon the valve D, the valve is lifted off its seat on the partition by the spring, so that the pressure again acts upon the membrane; and if the pressure is still further reduced, the valve will return to the seating on the supply C, and the main flame will be extinguished.

Indicating and Computing the Value of Meter-Index Movements.

Cox, G. J., of Melbourne.

No. 22,227; Sept. 26, 1910. Date claimed under International Convention, Oct. 4, 1909.

The object of this invention is to provide means whereby gas consumers—acting concurrently in a body, or otherwise—can individually and periodically inform themselves as to the volume of gas indicated on their respective meters, and the cash value of same, and "are enabled to tender a diagrammatic statement, and payment to the supplying body, for such commodity, without any necessity on the part of the body to first inspect the meters and render and collect conventional accounts for the commodity supplied." As an alternative, the consumers, "for reward or otherwise, can furnish the supplying body with data for statistical or other purposes, apart from account assessing considerations and proceedings; or consumers can apply portions of the apparatus included in the means aforesaid, for purposes of their own, which may include testing the accuracy of the accounts periodically rendered by the supplying body."

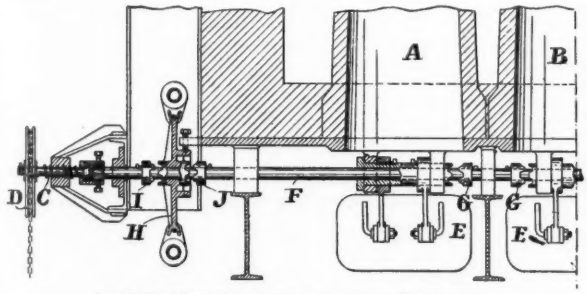
The arrangement referred to is one of a series of apparatus that has formed the basis of communications to "JOURNAL" pages by the patentee himself. The last of his articles appeared on Dec. 13 last year, p. 773.

Operating the Doors of Upright Retorts.

BOLZ, C., of Budapest, Hungary.

No. 28,942; July 28, 1910.

The illustration shows a side view (partly in section) of the mechanism proposed for controlling the opening and closing operations of the doors at the bottom of two retorts A B.



Bolz' Vertical Retort Chamber Door Mechanism.

The coupling and uncoupling are effected by a screw-threaded spindle C, adapted to be rotated in one or the other direction by a sprocket wheel D, actuated by a continuous chain. The doors E of the retorts are secured to hollow shafts mounted in brackets depending from the lower bottom plate of the bench; and at one of their ends the hollow shafts are constructed in the form of coupling members. The driving shaft F extends through the hollow shaft and to the front side of the bench. Clutches are provided at the ends of the hollow shafts with corresponding clutch members G secured to the driving shaft, so that, by forcing the driving shaft forwards or backwards, either the door of the retort A or of the retort B is coupled to the shaft F, so that, by rotating the shaft, either one of the doors can be opened or closed.

By rotating the sprocket wheel D and the spindle C to the right, the shaft F is forced backwards; so that the rear clutch G is thrown into engagement with its hollow shaft, and the door of the retort B is connected to the shaft. By rotating the wheel to the left, the door of the retort A is coupled to the shaft.

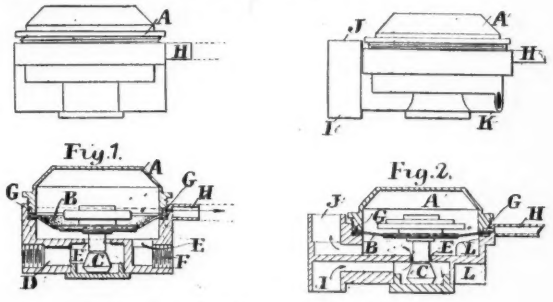
The mechanism for rotating the shafts of the lids is by means of pulleys and ropes, or chains and sprocket wheels. In front of the bench, the shafts F carry pulleys H, which are loosely mounted thereon, but are secured against lateral displacement. At both sides the hubs of the pulleys are constructed in the form of clutch members adapted to be thrown into engagement with clutch members I J respectively, mounted on the shaft F on opposite sides of the pulleys. The clutches are so arranged that, by throwing the member I into engagement with the pulley H, the clutch member G is simultaneously coupled with the hollow shaft of the door of the retort B. On the other hand, when throwing the clutch member into engagement with the pulley, the clutch member J is thrown into engagement with the door of the retort A.

Automatic Gas-Regulators.

WILLIAMS, G. A., of Stoke Newington, and CLARK, J. G., of Barnsbury, N.

No. 5028; Feb. 28, 1911.

This invention refers to regulators in which, in place of the usual apertures in the cover of the diaphragm chamber for the admission of air, there is a tubular projection upon the side of the main casing, to which is connected one end of a pipe whereby any gas that may reach that side of the diaphragm may be conducted to a point where it may be allowed to escape with safety. The bore of the projection is in communication with an annular chamber (in communication with the space above the diaphragm) formed at the lower end of a screwed cover, whereby the diaphragm is secured.



Williams and Clark's Automatic Gas-Regulators.

Fig. 1 shows the regulator adapted for use in conjunction with an ordinary gas stove or fire. Fig. 2 is a regulator for use in connection with public lighting.

Between the lower end of the cover A and a seat formed in the body of the regulator is the edge of a flexible diaphragm B, to which is secured the end of a spindle carrying at its lower end a coned valve body C, located in a chamber formed at the lower end of the case by means of a partition perforated for the passage of the spindle. The gas enters through the port D, passes up through the aperture in the partition to the underside of the diaphragm, and thence, through the opening E, to the discharge F. With diaphragm regulators as ordinarily constructed, the patentees point out, the gas would be allowed to escape through the aperture usually provided in the cover A to the room in which the regulator is placed. In order, however, that this may be prevented, there is a chamber G, which (in the present instance) is formed by removing a certain amount of metal from the lower end of the screwed portion of the cap A. This chamber is placed in communication with the interior of the cap; and this is preferably effected by holes formed in the reduced portion of the screwed part. On the exterior of the outer case is a hollow projection H, which, at its inner end, is in communication with the annular chamber G. Provision is made whereby a tube may be connected to the hollow extension, and led to some point where the gas may be allowed to escape with safety—say, to the air or mixing chamber of the bunsen burner, or even to a point adjacent the flame, or, if desired, the escaping gas may be discharged in the chimney.

In the public lighting valve illustrated in fig. 2, the gas inlet I and outlet J are formed, with their axes coincident, and at a right angle to the plane of the diaphragm. In this case, as in the former arrangement, there is an annular chamber G communicating with a tubular extension H upon the case. In order to facilitate adjustment and connection of the inlet and outlet pipes, there is an additional admission port K, and outlet port L, at right angles to the ports I J.

Wages of Stove and Meter Fixers at Stockport.—The Gas Committee of the Stockport Town Council have had under consideration the wages paid to stove and meter fixers in the employ of the department. It was decided that the minimum wage for such employees be 28s. per week of 53 hours; an amendment that plumbers be engaged to do this class of work at the standard rate of wages being defeated. At the last meeting of the Town Council, Alderman Allcock expressed regret that the Committee had not seen their way to employ practical men for the fixing of stoves and meters. There had been many complaints, he said, with regard to the way in which the work was being carried out, and also about the damage done to property. The rate of wages of the men who should do this class of work was 36s. 6d. per week, whereas the men who were doing it only obtained 28s. The time had arrived when the Corporation should employ practical men for the work, and pay a proper Trade Union rate of wages. Alderman Fernley, the Chairman of the Gas Committee, held that to pay plumbers to do this class of work would be an absolute waste of public money. It was not plumbing work, but gas-fitting. The minutes were confirmed without a division.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Arrangement and Use of Tar-Towers.

SIR,—I note, with pleasure, in your issue of May 9 Mr. Gill's comments upon the action involved when tar-towers are worked without equilibrium pipes. But he seems to miss the most interesting point—that such arrangements are acting as governors. The average pressure in his retorts would remain the same whether he pulled ½ inch, 1 inch, 2 inches, or any intermediate vacuum in the hydraulic main. When the charge was spent, he would in each case have "level gauge" in the retort. To put the matter plainly, Why use retort-house governors if an arrangement like Mr. Gill's will do the necessary work? The most serious disadvantage would be a slowness in responding to quick changes of vacuum; but this could be minimized by an ample circulation of liquor, as advised by Mr. Gill,

He touches a fresh point when he states that he finds ½-inch pressure in the retorts freshly charged varying to "level gauge" when about to be drawn. He, later, alludes to the ½-inch pressure as "the pressure given off by the production of gas." Most people, I believe, look at it from this point of view, without going much deeper into the matter. Their precise meaning is a matter of some doubt as to whether the pressure is due to the friction opposed to the flow of gas, or whether it is inherent in the liquor seal (or both combined). Mr. Gill's view seems to be the former—opposition by friction.

If the area and length of the ascension pipe is taken into consideration, it can be easily proved that 1-10th inch water column difference in head between the retort and the bottom of the dip-pipe is ample to pass the greatest volume of gas likely to be evolved. It follows that practically the whole of this initial pressure is due to the employment of a sealing liquid. And this can be demonstrated. It is practically universal to arrange the pull or vacuum equal in extent to the depth of seal, and secure a so-called "level gauge" in the retort. A moment's consideration will show, however, that only when the liquid is at rest can the condition of level gauge apply to the retort. Directly gas is evolved, it must depress the liquid below the level of the dip—forming a bubble, which ultimately breaks. In other words, the gas requires an area below the dip sufficient in extent to allow of its escape through the liquid. The pressure in the retort will then be equal to a column of water one-half the depth to which the liquor is depressed below the dip-pipe.

This can readily be calculated if we know the volume of gas passing and the area of the dip-pipe. To take an instance: A works makes 7000 cubic feet per mouthpiece per 24 hours, with six-hour charges, and uses 5-inch dip-pipes. Probably, under these conditions, 14 per cent. of the gas from each charge is evolved in the first hour, at a temperature of (say) 110° C. in the dip-pipe. And, along with the gas vapours of water and hydrocarbons are given off to the extent of some 100 cubic feet (roughly). The total volume passing through the dip-pipe would be some 450 cubic feet in the first hour. The velocity at the end of the dip would be about 3300 feet per hour (the reader can work through the details).

The problem now is: What extension below the dip would suffice to pass a volume of 450 cubic feet per hour at a velocity of 3300 feet per hour? Since the circumference of the 5-inch dip is 1·31 feet, we have in inches $\frac{450 \times 12}{1{\cdot}31 \times 3300} = 1{\cdot}2$ inches as the required extension. Since the effective water pressure is just half this depth, we should have 6-10ths inch water column pressure on the retort.

This, I believe, is not very far from the mark, It will, of course, gradually drop as the volume of gas evolved diminishes. Within reason, the depth of the seal makes absolutely no difference to the extent of this pressure. It is solely due to the fact that the dip—as its name implies—is dipping into a liquid; and whether we pile up above the end tenths or inches of liquor, the pressure as calculated above will still hold good.

I must apologize for taking up your space, but the diverse views held would seem to warrant this treatment of the matter.

A. EDWARDS.

Laboratory, Corporation Gas Department, Leeds, May 12, 1911.

The Heating of Flueless Rooms.

SIR,—My reference to the unfortunate partizan nature of his recent paper has, I fear, caused a degree of annoyance to Mr. Brearley which I did not intend or expect. His partizanship was so obvious to me, and not to me only, that I should not have expected he would have thought of disclaiming it. Far be it from me to take offence, as Mr. Brearley (and probably no other reader of my criticism) conceives me to do, at his lack of impartiality. I am only desirous of making it clear to the unwary that his dictum on the present occasion is no impartial pronouncement, but a plea for one type of apparatus.

Once your readers have realized this, they will take his advocacy of that type with the necessary allowances, and will remark that, rather than replying to my criticism, he puts me down once and for all by describing me as a "trader," and threatening that if I am equally frank in criticizing him another time, I must be excluded from such meetings. I cannot but believe that, in a moment of less irritation, Mr. Brearley will regret this unfortunate lapse from good taste, in which I do not believe any other gas engineer in the country would sympathize with him. Mr. Brearley is a trader in gas; and I am a trader in apparatus for consuming it. Both are respectable occupations. But the invitation to take part in the meeting, with which he and I were both honoured, was probably given not because of our being traders, but on grounds of technical experience; and Mr. Brearley's attributing of my criticism to commercial zeal is a misrepresentation of which he would not have been guilty had he remembered the fact I mentioned—that I have no bias except in favour of the facts—seeing that I am a maker of, and a believer in, both kinds of apparatus, each for its own suitable use. Nor is he more happy when he suggests that his naming of one particular make (which I am glad to see he now regrets) was the main point in my criticism. That was only mentioned as an illustrative detail. What I called attention to was his failure to hold the balance between two different methods, each with a place of its own.

Once again Mr. Brearley mistakes my plain meaning in a way a man of his training should not have done. He suggests that I think there is no difference between the lighting problem and the heating problem. I never said so; and I am not to be drawn into the irrelevancy of saying so now. I was dealing with a specific quotation from a very excellent and impartial former paper of his regarding the effect of the burning of gas on the air of a room; and I pointed out that these remarks applied with equal force whether the gas were burned for lighting or for heating. Mr. Brearley now tries to turn aside the effect of this quotation from his own writings by suggesting that what is true of gas burning at gas-bracket level, becomes untrue when it is burned at the floor level in a radiator. This will not do at all. If it were so, it would make Mr. Brearley's former statement woefully unguarded in its sweeping effect; but, as a matter of fact, there is no ground whatever for the distinction, which, by an afterthought, he now seeks to set up to get out of the difficulty in which I placed him.

Mr. Brearley has evidently been refreshing his mind as to the law of diffusion; but he stumbles through trying to use that one law in isolation from other elements in the case. Without needing to calculate (at his invitation) the fate of the upward stream of heated products, I will simply remind him that when gas is being burned in a room, the air near the roof always holds a much larger proportion of carbon dioxide than the air at breathing level; and I would also recall Dr. Toogood's statement—now hall-marked with Mr. Brearley's approval—that these heated products quickly ascend above breathing level. That is my case. Whether they escape directly, with no further admixture of the air, or remain and undergo further diffusion, they do not have to be inhaled at breathing level in a properly ventilated room. This is Dr. Toogood's view; and it is mine. As regards the carbon dioxide escaping pure, I have once again to deal not with what I said, but with what Mr. Brearley says I said. Mr. Brearley knows I never said anything so absurd, and could have no possible object in doing so. He has admitted all my position when he approves Dr. Toogood's statement; and his quibble about carbon dioxide escaping pure may be left to answer itself.

One more point and I think I have done with Mr. Brearley. He says gas-radiators need an amount of extra ventilation which renders them not so economical as the warm-air method he espouses, with its electric motors, fans, &c., regarding the comparative cost of which there is no vestige of what he calls "irrefutable figures," or indeed figures of any kind; and in this same earlier paper of his, he doubts the hygienic value, and in some cases the economy and advantages, otherwise, of this very warm-air method, to the virtues of which he is now so enthusiastic a convert. As against his theorizing on this subject, I am content to leave the statement I made a week or so ago as to the results of my numerous test analyses taken all over the country, which prove how the use of the radiators so stimulates ventilation, as to often substantially reduce the proportion of carbon dioxide in the room. I quoted one case where the radiators effected a reduction from 19·3 to 8·7 parts per 10,000, while the room was adequately and economically heated. These are indeed "irrefutable figures;" and Mr. Brearley will continue to theorize against them in vain.

I am sorry Mr. Brearley should resent my criticizing him; but he can hardly complain, for he himself singled me out for quotation and adverse criticism. Now that I have answered him, he is for punishing my temerity by having me excluded from such meetings in future, and possibly, for anything I know, from your columns as well. But criticism must continue to work both ways. Mr. Brearley cannot expect to publicly criticize people, and then "call down fire from heaven" to consume them (with or without resultant carbon dioxide!) when they venture to reply. The fact is Mr. Brearley's partizan treatment of a theme which might so helpfully have been treated quite impartially was a new departure for him; and I believe he already sees his mistake. I am sure he will be extremely cautious about trespassing again in the same way; and if my criticism has helped to engender that caution, I shall have done him a good service.

H. JAMES YATES.

Essex Works, Birmingham, May 11, 1911.

Extraction of Sulphur Compounds.

SIR,—We have read with much interest Mr. G. M. Gill's article on the above subject in your last issue, more especially as we have recently been in correspondence with several well-known gas engineers relative to the adoption of similar methods to those suggested by the late Mr. R. H. Patterson, and to which Mr. Gill refers at some length. Unfortunately Mr. Patterson's pamphlet on this subject (published in 1874) is out of print. We, however, have a copy, and would be glad to lend it to any engineer who is interested in the matter.

Mr. E. A. Harman's pamphlet, on "Gas Purification" (published in 1898), is also interesting in the same connection. On p. 21, he states that "a good deal more could be done by liquid purification than is presently accomplished, and this principle was generally recognized in the early days of gas purification."

Mr. Harman also remarked that it was "far easier to subdivide the gas into anything chosen than to subdivide water"—this being *à propos* of "finely-divided spray" in scrubbers. Since then, however, centrifugal washers have been introduced; and we have on order one of these machines which we understand will be used in connection with a process somewhat on Patterson's lines. If this is carried out, we may (with the engineer's consent) possibly be able to give some information at a later date which may be of interest to your readers.

We are inclined to think that this type of washer will be found more efficient for the required purpose than the "bubbling" type to which Mr. Gill refers.

KIRKHAM, HULETT, AND CHANDLER, LTD.,
SIDNEY HERSEY, Managing-Director.

Palace Chambers, S.W., May 11, 1911.

Lighting of Market Halls.

SIR,—As you were good enough to refer to the lighting of Burton-on-Trent Market Hall in your issue of April 11, I am enclosing you a photograph of the interior of the hall taken at dark by ten minutes' exposure to the light from the "Dacolight" regenerative inverted incandescent gas-lamps in the body of the hall and ordinary upright incandescent burners round the balcony. There was no other source of light in the place.

The market hall is 126 feet long, and 75 feet wide (shop front to shop front). It is 28 feet high to the underside of the roof; and the twenty-two lamps are all of them hung at a height of 13 feet from the ground.

There are four five-burner lamps down each avenue, with two extra ones at the end near the clock, and a smaller three-burner lamp to light up the clock face. The Markets Committee entrusted the work to the Gas Department; and it still continues to give satisfaction to the Committee and the stall-holders—the lamps being looked after by the Gas Department workmen.

R. S. RAMSDEN.

Burton-upon-Trent, May 12, 1911.

Professor Bedson's Experiments at Elswick Gas-Works. A Correction.

SIR,—In the account of my lecture to the North of England Gas Managers' Association given in the "JOURNAL" last week, there is a misstatement at the top of column 3 in the table headed May 4, p. 374: "Calorific Power. B.Th.U." The "B.Th.U." is evidently out of place, as the calorific power is given in kilogramme-centigrade-calories per cubic foot.

I shall be obliged if you could correct this.

Armstrong College, Newcastle, May 12, 1911. P. PHILLIPS BEDSON.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: London County Council (General Powers) Bill, West Cheshire Water Bill, Wirral Water Bill.

Bills reported: Chichester Gas Bill, Kingston-upon-Hull Corporation Bill, Weston-super-Mare Gas Bill.

Bill read the third time and passed: Harrogate Corporation Bill.

The Chesterfield Gas and Water Board Bill, Gaslight and Coke Company Bill, and Northampton Corporation Bill have been referred to a Select Committee, consisting of the Earl of Plymouth (Chairman), Viscount Falmouth, Lord Zouch of Haryngworth, Lord Ravensworth, and Lord Clanwilliam; to meet to-morrow.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Harrogate Corporation Bill.

Lords Bills read a second time and committed: Luton Gas Bill, Oystermouth Urban District Council Bill, Sidmouth Gas and Electricity Bill.

Bill reported, with amendments: Slough Urban District Water Bill.

Bills read the third time and passed: Chasetown Gas Bill, Chesham and District Gas Bill [Lords], Luton Water Bill [Lords], West Cheshire Water Bill, Wirral Water Bill.

The Local Government Provisional Order (Gas) Bill (No. 2), to confirm a Provisional Order relating to Droitwich, has been presented, read the first time, and referred to the Examiners.

The Barnsley Gas Company have petitioned against the Local Government Provisional Orders (Gas) Bill, in respect of the Cudworth Gas Order; the Birkenhead Corporation, against the Chester Water Bill [Lords]; and the Sidmouth Urban District Council, against the Sidmouth Gas and Electricity Bill [Lords].

SWANSEA GAS BILL.

House of Lords Committee.—Tuesday, May 9.

(*Before the Duke of* WELLINGTON, *Chairman, the Earl of* LYTTON, *the Earl of* LONDESBOROUGH, *Lord* LONGFORD, *and Lord* LEIGH.)

This is a Bill promoted by the Swansea Gas Company, by which authority is sought, among other things, to acquire lands compulsorily and by agreement, and to raise additional capital for the extension and development of the undertaking.

Mr. HUTCHINSON, K.C., and Mr. TYLDESLEY JONES appeared for the promoters. The opposition to the Bill was represented as follows: Mr. VESEY KNOX, K.C., for the Swansea Corporation; Mr. BEVERIDGE, for the Rural District Council; and Mr. R. WILLIAMS, for interested owners and occupiers.

Mr. HUTCHINSON, in opening, said that originally the Company was incorporated in the first year of the reign of William IV. In 1861, it was re-incorporated, and the limits of supply were fixed to be the town and parish of Swansea, together with the parish of Oystermouth, and places within one mile of the borough boundary. Again, so late as 1910 the limits of supply were extended so as to include part of the rural district of Swansea. The Company had been very successful. Although there were several opponents to the Bill, no complaint emanated from them in regard to the way the Company's business had been carried on in the past. So successful had been the Company's operations, that, whereas in 1897 the total number of consumers supplied with gas for all purposes was only 5300, in the completed year of 1909 they approximated to 19,000. Ten years ago, 300 million cubic feet of gas were supplied to the consumers per annun; at present, 477 millions were supplied. This was equivalent to an increase of 60 per cent. The maximum price was 3s. 6d. per 1000 cubic feet; the Company having the right to charge outside the area 4d. per 1000 cubic feet more than the cost of the gas supplied to Swansea. At present, the Company were supplying Swansea at the low price of 2s. 8d. The area was a very large one, embracing 50 square miles. The expenditure of capital had been increased very considerably, because of the nature of the consumers in a town like Swansea. Apparatus for supplying gas in pennyworths was somewhat costly, and added very much to the amount of capital necessary when such consumers were numerous. Swansea was an industrial town situated very low down near the sea; and there were appreciable difficulties in supplying the districts higher up. In order to provide the large number of consumers in such districts with gas, the expenditure of capital was necessarily high. There were a number of valleys, each of which had to be fed by a separate main. Cardiff, with 25,000 consumers, carried 159 consumers to every mile of main; Newport, with 14,270 consumers, carried 161 per mile; and Swansea, with 19,000 consumers, carried only 147 per mile. He attributed this to the peculiar circumstances of the case. Although the supply was very large, the amount of building going on in Swansea would compel the Company, if they intended to maintain their supply, to expend a great amount of capital. Finding that the rate of progress was so rapid, the Company took a very broad view of the situation, and had come to the conclusion that their works had to be very materially increased. They had acquired, and looked forward to using for manufacturing purposes, a piece of land known as Vetch Field, which they considered suitable for the extension of their works. They asked for compulsory powers in regard to property bordering this land, and also in regard to property in Wellington Street and Bathurst Street adjoining the existing gas-works. The property affected at Vetch Field was in William Street and Glamorgan Street.

Mr. VESEY KNOX intimated that the Corporation were the owners of all the land affected, except that in William Street. The Corporation would not resist the compulsory acquisition in regard to Bathurst Street and Wellington Street. They were anxious to have a widening of the road in Wellington Street; but they would not, of course, ask the Company to pay for the part thrown into the road.

Mr. HUTCHINSON (continuing) said that the real intention of the Company in enlarging their works was to use the land at Vetch Field which they had already acquired, and to purchase other lands. With regard to the second object of the Bill, he thought that in 1861 the capital granted was about £100,000, with an addition of one-fourth in the shape of borrowing powers. Again, in 1888 further capital powers were granted; and in 1898 the Company converted and consolidated the whole of their capital into share capital bearing a uniform rate of maximum dividend of 5 per cent. The consequence of this was that the amount of capital was fixed in respect of the old capital by the Act of 1898 at £202,000; and in addition to this they had further capital powers granted of £130,000. So far as the share capital at the present moment was concerned, they had £322,000, all of which had been issued with the exception of £1800. The loan or borrowing powers amounted to £67,500; and of the total capital powers of the Company, consisting of £389,500, all had been expended with the exception of £22,191. The Company found in December last that they had expended, over and above their authorized capital, the sum of £69,380; so that if they deducted the amount not expended (£22,191), the Company had to repay an indebtedness of a little over £47,000. The Company asked their Lordships to give them by way of new share capital £200,000, and borrowing powers amounting to £66,667. In addition to this, they asked for an increase in the amount of loan capital in respect of the old capital to the proportion of one-third—giving them another £22,500, and increasing their new capital powers to £289,167. There were three petitions. The Corporation of Swansea submitted that no power should be conferred in the direction sought unless provision was made for the widening at Wellington Street, together with adequate protection for the petitioners' property. They also submitted, with reference to the Vetch Field proposal, that the manufacture of gas there would be detrimental to the surrounding property, would destroy the amenities of the district, and was objectionable from the public point of view. When their Lordships learned that one of the chief amenities in the part of the district in which the youthful inhabitants disported themselves was a sewage outfall which overflowed, he did not think they would lay very great weight

on the character of the property the Corporation endeavoured to depict in such favourable colours. The Corporation objected to the carting of materials between the two works; but as they would not be parties to a tramway which the Company were prepared to construct, the Corporation were surely responsible for any objection there might be to this proposal. The Corporation also submitted that the additional capital was excessive; and they objected to the stand-by clause in regard to people who had both electricity and gas—the Company, of course, asking that such consumers should pay a little more for the increased burden on the Company. The Company also proposed to introduce suction gas in certain cases; and to this the Corporation and the Rural District Council objected. With regard to the owners' and occupiers' petition, he was told that not one of the signatories was an owner. This petition was based on the assertion that it was unnecessary to acquire the property affected.

Mr. *George T. Andrews*, the Manager of the Company, examined by Mr. TYLDESLEY JONES, said he made an estimate of the capital required by the Company in the next 12 to 15 years. The present daily make was about 2½ million cubic feet; and he estimated that during this period they must be able at least to double the output. His estimate was upon this basis. To meet their needs, they would require for land, mains, plant extensions, and ordinary meters £250,000. In addition to this, they would want a sum for coin-meters, as the district was one in which there was a great demand for these. At the rate of 600 per annum, he estimated they would require a sum of £54,000 for this purpose. He also included a sum of £12,500 for cooking-stoves. This made in all an estimated capital requirement of £316,500. With the over-expenditure of £47,000, this was increased to £363,000. The Company were therefore within the mark in asking for £289,000. They would spend £104,000 of this capital almost immediately. They had four gasholders; but they were practically reduced to the use of only two of these, and they would require others. There were 20,936 inhabited houses in Swansea; and houses were being built as quickly as possible. Builders were putting up streets of 200 or 300 houses. The Company had now 19,099 consumers, of whom 10,855 had coin-meters. In the last five years, an average of 678 consumers had been added to the coin system. The consumption per consumer in the last ten years had fallen from 33,752 cubic feet to 27,338 feet. This was due to the expansion of the coin-meter system. The average consumption per consumer on the coin-meter system was 12,000 cubic feet per annum. The Company estimated that the coin-meter consumption in twelve years would be 93 million cubic feet; and in fifteen years, 107 millions. At the end of the latter period, the Company estimated they would have to supply a total of 850 millions. This was based upon a 4 per cent. compound increase on the present consumption. Having regard to the increase in the past, he thought this estimate could be justified. The proportionately large capital expenditure of the Company was partly explained by the configuration of the district, as they had to carry their mains round a high hill.

Mr. VESEY KNOX said he was prepared to agree to 4 per cent. compound increase; but this did not amount to doubling in 15 years.

Witness, in further examination, stated that the existing works were so crowded that land was immediately required for extensions. The Company were at present using Vetch Field for storing materials; but they wished to be able to manufacture there. He did not think they would be able to meet their statutory obligations in the next five years without some such provision being made for the extension as was now proposed.

Cross-examined by Mr. VESEY KNOX: They were paying an annual rent of £470 for Vetch Field. The Company would have to carry their material in some form to Vetch Field; but he did not agree that there would be two nuisances in the town instead of one. The centre of odour, as Counsel called it, was so small that a line could be drawn round both. It was true that there were over 500 people living within a 300-yard radius of the proposed site; but residents were now moving out of Swansea, though he did not see why they should avoid this part of the town at all. At the existing works, the Company had a new up-to-date retort-house with a daily capacity of 2,400,000 cubic feet. Then they had an old retort-house which had been dismantled. The latter was not suitable to meet Counsel's suggestion that it could be so extended into Bathurst Street as to give a capacity of 2,400,000 cubic feet. It might be possible to use it as a reconstructed retort-house; but the Company had decided to employ it as a coal-store. He did not have a plan of what it was proposed to do with these works. The coal which the Company used turned out about 10,000 cubic feet of gas per ton. He dissented from the suggestion that the reconstructed retort-house would enable the Company to meet the full estimated supply 15 years hence. If their sale was 850 millions, they would want to produce 10 per cent. more than 4,500,000 cubic feet in one day; and it might be possible to make the required quantity under Counsel's suggestion. The daily capacity of the purifiers was about 2¾ million cubic feet. They might be able to put up new purifiers which would pass an additional million or million and a half cubic feet. He did not assent to the view that all the Company really required at Vetch Field were a coke-store, another holder in a corner of the land, and fitting shops. They wanted purifiers, holders, and stores there; and though they might conceivably get along for a few years, ultimately the Company would require to manufacture at Vetch Field. Witness denied that the reason the Company did not bring their reserve fund up to the maximum of £32,000—as they might have done, having a carry-over of £34,000—was that application might then be made to Quarter Sessions to compel the Company to reduce their price. The Company reduced the price by 2d. last year. He did not agree that they might easily have taken off an additional 3d.

In answer to Mr. WILLIAMS, witness said there had been no complaints for the last 10 or 15 years. Some newly-elected councillors, he believed, had called an "indignation meeting" since the promotion of the Bill. The Company's proposal was to demolish 80 houses.

In re-examination, witness stated that it would be possible for the Company to crowd on to the land adjoining the existing works more plant than they could economically work. The carry-over referred to had been used as working capital.

Mr. *H. E. Jones* said that, having been in practice in the Swansea district, he knew the undertaking fairly well. The Company's business had increased by 60 per cent. in ten years; and at the same rate of progress, they would double the business in 12 years. The existing works were uneconomically crowded; and he would not recommend the Company to spend any more money on the present site, which was congested. New works were necessary; but the Company ought not to instal works capable of a make of less than 2½ millions. Five acres of land were required; and he considered Vetch Field a suitable site. The circumstances of the Company's supply were such as to require an expenditure of capital above the normal, particularly in regard to slot-meters and mains. In the interests both of the consumers and the undertaking, the Company ought to be permitted to manufacture gas at Vetch Field. The Company charged a moderate price, and were content with only a moderate dividend. He would call them a well-conducted Company. The length of mains was quite unusual. The capital asked for was reasonable; and as the district affected by the new works scheme was not a residential one, there would be no injury to the surroundings.

In cross-examination by Mr. VESEY KNOX, witness said that, when estimating the enormous number of future consumers, he could only be guided by the experience of the past, which he took in conjunction with the growing use of gas. Both for ordinary and manufacturing purposes there was an extraordinary development in the use of gas. He could not mention the case of a maximum company, as opposed to a sliding-scale company, who had been allowed, in the face of opposition, to start a special purposes fund as well as a reserve fund. He was also afraid he could not quote the case of a company who, faced with opposition, obtained power to take land compulsorily.

Replying to Mr. BEVERIDGE, witness said he had never seen in operation the suction-gas clause. He agreed that it might tend to set up a lot of separate and independent installations; but he did not agree that the more there were of these, the less likely were the Company to extend their mains.

Wednesday, May 10.

On the resumption of the proceedings to-day,

Mr. *H. E. Jones* continued his evidence. He affirmed that, in order to provide good gas at a low price, serviceable plant was indispensable. In the case of Swansea, new works were absolutely necessary; and as the present site was already congested, the extension must take place elsewhere. After a careful study of the prospects of the Company's undertaking, he felt convinced that, in an industrial place like Swansea, the output would need to be doubled within the next 12 or 15 years. Any reduction in the capital the promoters asked powers to raise would tend to inefficiency—indeed, they really ought to spend more than this amount.

In reply to Mr. VESEY KNOX, witness said he was not aware that one of the gasholders was useless for the purpose of pressure. He knew it was somewhat worn, but it could be easily and cheaply replaced; while there were devices for making up pressure by mechanical propulsion.

Mr. *Charles Carpenter*, the Chairman of the South Metropolitan Gas Company, was the next witness. Replying to Mr. SZLUMPER (Counsel for the promoters), he said he had carefully examined the existing gas-works at Swansea, and also the site of the proposed extension, which occupied 5½ acres. The existing plant had been well devised, well constructed, and well maintained. One of the disadvantages of the present works was that they were congested and incapable of being expanded economically. In his opinion, the new site was not only desirable, but essential for the development necessary to meet the future requirements of the town. The Vetch Field site offered no engineering difficulties; while the 300 yards limit around the new site embraced a part of the 300 yards area around the existing works. He considered it would be waste of money to rebuild the two small tanks, which were some forty years old. The nature of the houses and property in the vicinity of Vetch Field was not dissimilar to the property around the South Metropolitan works in the Old Kent Road; and the works there proved no nuisance, and there were no complaints from occupants. With the elimination of the nuisance which formerly arose from the use of lime, there was no reason why gas-works should be a greater nuisance than any other form of manufacture. He had seen as much smoke arise in Eaton Square in a morning as there would be from these works. He would certainly not recommend the spending of a penny on the extension of the present works on the only land available. Provision would have to be made within the next 12 or 14 years in order to sell 850 million cubic feet. The Company were actually asking for less capital than the detailed estimates showed they might require. The amount of capital was a fair one, having regard to the probable requirements of the undertaking.

In reply to Mr. VESEY KNOX, witness said there was no disadvantage in living near gas-works. Personally, he knew the advantage of living in their proximity. Gas-works created no more nuisance than other factories. He mentioned the fact that less than three-quarters of a mile from the Committee room there were gas-works with an output five times as large as that of the Swansea Company. On a tidal river there was a flow of air in either direction; and if the gas-works were a nuisance, people in the Houses of Parliament would experience it twice in the 24 hours. He advocated these works because they were a public necessity. The facilities of the Company for handling and storing coke were most uneconomical. He would not advise the construction of new works on the land proposed to be compulsorily purchased in Bathurst Street; but he thought the land might very advantageously be used for coke storage. At the present time there was no room for coke storage. There ought to be room to store 700 or 800 tons. To have to sell coke as soon as made was uneconomical, either at Swansea or elsewhere, because the demand was not an equal one. The demand greatly exceeded the supply sometimes; and the coke ought to be stored against such demand. It would be very inadvisable to cart it away to Vetch Field for storage, because the coke produced from South Wales coal was very friable, and the more it was handled the less it was worth. Asked if he had never recommended the transfer of holders from the centre of manufacture to another site, witness said he had never been consulted on such a matter. He admitted, however, that, in the case of the South Metropolitan Gas Company, there were

holders three-quarters of a mile from the works, and this circumstance presented no serious difficulty.

In re-examination by Mr. SZLUMPER, witness said Swansea was a place of smells. The air was redolent of noxious odours inseparable from certain manufactures; and, in comparison, gas-works did not detract from the amenity of the neighbourhood of Vetch Field.

Mr. *W. R. Herring* agreed with the evidence of the previous witnesses as to the desirability of utilizing Vetch Field for the expansion of the works that were necessary. The number of consumers had increased from 5300 in 1895 to 19,099 in 1910. There was no practical commercial disadvantage in sectionalized works now-a-days. In his view, it would require £361,000 for the new works; and this capital would be expended over the period for the next 12 to 15 years. The amount of capital asked by the Company was quite reasonable—rather less, in his opinion, than his estimate of the proposed expenditure. It was not possible for the Company to continue the development of their business on the existing site.

Mr. *W. J. Rees*, a Director of the Swansea Gas Company, said he did not believe it had come as a great surprise to the people of Swansea when the Bill was deposited. There had been a notice board on Vetch Field for a long time bearing the following intimation: "Swansea Gaslight Company, Development Ground." So that it was well known throughout the district that it was the intention to manufacture gas there. There had not been any objection to this up to the time the Bill was promoted, and there had been no complaint of the existing works.

In cross-examination by Mr. VESEY KNOX, witness said he had been told that the Company must go to Parliament for powers to manufacture gas on Vetch Field; but he did not know that they were prohibited by Act of Parliament from using the land for this purpose.

Mr. SZLUMPER, in re-examination, asked witness whether he was not aware that Parliament permitted gas companies to acquire land by agreement other than lands upon which they were entitled to construct gas-works; that Vetch Field was purchased by agreement in 1900 under that provision; and that now the Company were asking Parliament to empower them to manufacture gas on this site. Witness replied that he understood this to be the case, and added that, had the Company not purchased Vetch Field in this way, they would be in the position of being unable to keep pace with the demand for gas, unless they sacrificed their present works and constructed new ones on the outskirts of the town.

Mr. *E. H. Leeder*, an agent for eight large estates in Swansea, declared that, had he believed that the construction of gas-works on Vetch Field would damage the neighbourhood, he would have opposed the Bill. He believed that all lands which the Company sought to acquire were necessary to their undertaking.

In cross-examination by Mr. WILLIAMS, on behalf of local residents, witness agreed it might be a hardship to turn people out of their houses; but in the interests of the community as a whole, this had to be faced.

In reply to the CHAIRMAN, witness said that the 300 yards circle round Vetch Field would embrace approximately about 1000 houses with an estimated population of 5000.

This concluded the case for the promoters.

Evidence in opposition was then heard.

Mr. *Mason*, of Messrs. Powlesland and Mason, part of whose premises it was proposed to compulsorily acquire, urged that the Company should take over the whole of his premises or leave him in possession. He doubted if he would receive full compensation from any arbitrator who might be appointed.

Counsel for the parties were asked jointly to draft a protecting clause and submit it to their Lordships.

Mr. *E. H. Stevenson* gave evidence on behalf of the Corporation. In reply to Mr. VESEY KNOX, he said he had known Swansea for 35 years. He agreed that the Company's undertaking was likely to increase by 373 million cubic feet of gas in 15 years—that was to say, at 4 per cent. compound. He had advised the Corporation that the land proposed to be acquired in Bathurst Street and Wellington Street was necessary for the extension of the Company's business, and that no one would suffer from its becoming gas property. On the other hand, he did not think, in view of the fact that the town had practically no houses unoccupied, that the Company should be allowed to acquire the land bordering Glamorgan Street and William Street, which was covered with houses. As to the Company's works, he regarded two of the holders and one of the purifying-houses as obsolete, and considered larger gasholders would need to be provided. There was plenty of room on the present site for further extension if the land was put to the best use. It would be a very great drawback to have the manufacturing works of the Company divided. The disadvantage was intensified when it involved cartage. Of course, this did not apply to large works such as those in London, in which case it was rather an advantage to have a division. The retort-house and the carbonizing plant had a far greater capacity than the present needs required. With the single exception of storage, there was sufficient room on the present site; and it would be more economical to have the works all on the same site rather than divided as was proposed. Vetch Field should be used for gasholders and workshops. Holders of 6 million cubic feet capacity could be put there. Gasholders did not cause any nuisance. There would be no difficulty in extending the works so as to be sufficient for thirty years without using Vetch Field for manufacturing purposes. As to the state of the Company's accounts, witness said there was standing to reserve £22,663, and with two other funds of £16,364 and £4190 respectively, they had a total of £54,656, out of which they could fill up their reserve fund. In addition, they had written-down meters and stoves to something between £30,000 and £35,000, though he did not say there was anything wrong in this. In his opinion, the carry-over should be limited to one year's dividends. When it was greater, it suggested "moral obliquity"—preventing the consumer from applying for a lowering of the price. Witness also spoke against the clauses which proposed a stand-by charge for consumers who only used cookers in the summer and for those who only used heating stoves in the winter. The policy of Parliament was not to allow a gas company compulsorily to acquire land if the owner opposed. It was different with Water and Railway Bills; for in those cases the land in question might be the only available land. In the case of gas companies, it was always a question of saving money.

In cross-examination by Mr. HUTCHINSON, witness agreed that in 1898, when he appeared as a witness for the promoters, he might have said that capital representing £850 per million cubic feet was not too excessive; but he had always thought that the capital of the Swansea Company was high. There was a real difference, not merely of phraseology, between the terms "too excessive" and "high." It was higher to-day than it was in 1898. With the growth of the town, it should have gone down. Gas-works could not exist without creating an unpleasant odour; but the smell was a healthy one. In his opinion, it was bad to have two sets of small gas-works when they could just as well have one large works. The stand-by clause had been declared by Parliament to be unjust. Where it had got through, was always in Unopposed Bills.

Thursday, May 11.

On the resumption of the proceedings to-day,

Mr. *George Bell*, the Borough Surveyor of Swansea, gave evidence. He asserted that the smoke and fumes from the top of the stack and from the retort-house of the existing gas-works were a great nuisance to the town. He had not, on behalf of the Corporation, complained to the Gas Company of the fumes. He admitted that there were other works in Swansea which emitted unpleasant odours, but declared that these were situated in the works district, and not in the residential part of the town. What the Corporation objected to was the setting up of another source of nuisance where it was unnecessary.

Mr. VESEY KNOX then addressed the Committee on behalf of the Swansea Corporation, who considered they were performing a public duty in opposing the Bill. They asked that the measure should not be passed except with the conditions that no part of Vetch Field should be used for manufacturing purposes; that only storage should be permitted there; that the balance of land not required for storage should be used to build thirty houses; that compulsory purchase powers should be granted only as to houses in Wellington and Bathurst Streets; that the carry over should be limited to one year's maximum dividend; that the Company should fill their reserve fund out of the carry-over and use any balance to reduce the price of gas; that no other funds should be formed except the reserve fund; and that the new capital should be limited to £150,000, as Mr. Stevenson had suggested, and not to £200,000 as the promoters asked.

Mr. BEVERIDGE, in summing up the case of the Swansea Rural District Council, opposed the provision in the Bill which required that if a man had electricity for lighting purposes and happened to have gas laid on, he should be liable to a minimum charge of 25s. per quarter, even though he made no use of the gas. He asked the Committee to decide that consumers should be charged only for the gas they actually used. The minimum charge, he argued, would prevent people who desired a supply of electricity for lighting their houses from taking it, because they would be subject to gas charges. This would be detrimental to the Rural District Council, who were electricity undertakers under a Provisional Order in part of the district.

Mr. WILLIAMS, in stating the case of 67 persons interested in property within 300 yards of Vetch Field, declared that it was absurd for the Company to say that no nuisance arose from gas-works. He strongly opposed the Company's application for power to acquire and demolish the 82 houses they proposed. Houses were scarce in Swansea; and the poor people in this district should have extra care taken of them, because they were tied to the locality by reason of their work being there. To manufacture gas on Vetch Field would be to lessen the amenities of the district, and use the only available site for houses.

Mr. HUTCHINSON was about to reply for the Company, when

The CHAIRMAN said: The Committee have had an opportunity of considering the main question, and we have come to the conclusion that we will allow the Bill to proceed under certain conditions. We will give the full powers as regards acquiring the land; but we will put in certain conditions in the clauses as regards capital. We shall require you to reply to the objection of Mr. Vesey Knox about the capital; but we shall not require you to reply respecting the acquisition of land, with regard to which we authorize the Bill to proceed.

Mr. HUTCHINSON accordingly confined himself to the financial question, arguing that the Company were justified in asking to be allowed to raise £200,000 of capital. As to Mr. Vesey Knox's criticism respecting the reserve fund and excess profits, the Company would raise no objection to the Committee inserting a provision that they should not carry over in the future a greater sum than was necessary to pay one whole year's dividend in respect of the capital which was employed in the previous year.

The Committee then deliberated in private respecting their decision. On the parties being again admitted,

The CHAIRMAN said: As I mentioned, what the promoters ask for as regards the acquisition of land is granted. The capital asked for is granted. Clause 21 is struck out, and a new one is to be inserted agreeing very much with what Mr. Vesey Knox asks for. The carry-over is to be limited to one year's maximum dividend; and the Company are to fill their reserve out of the carry-over, and use the balance to reduce the price of gas. The Committee do not insist on anything about any other fund. In clause 40, we require it to be more clearly defined that it only refers to cases where gas is provided merely to be used as a stand-by. Clause 41 stands. Clause 43 stands, with the addition of the words "or domestic use." Clause 46 stands; and we do not give the clause asked for by the Rural District Council. I think this includes all the matters in dispute.

Clause 21 deals with the power to create a special purposes fund. Clause 40 provides for a minimum charge of 25s. a quarter for gas laid on to premises having a supply of electricity.

Clause 43 reads, with the addition:

Notwithstanding anything contained in any enactment to the contrary, the Company shall not be obliged to give from any main a supply of gas for any purpose other than lighting "or domestic use" in any case where the capacity of such main is insufficient for such purpose, or if and so long as any such supply would, in the opinion of the Company, interfere with the

sufficiency of the gas required to be supplied by means of such mains for lighting "or domestic use."

Mr. HUTCHINSON said he would draft clauses to meet the decision.

Friday, May 12.

The parties attended to-day for the adjustment of clauses.

Mr. VESEY KNOX, at the outset, said that the Corporation had considered very fully their Lordships' decision on the question of the land and other matters raised, and they desired to have an opportunity, if necessary, of again fighting the case in the other House. At this stage he wished only to go on in order to see that their Lordships' decision was carried as to the reserve fund and cognate questions.

Mr. HUTCHINSON then put in the following clause dealing with the application of excess of profits on behalf of the Company, and submitted that it carried out the decision :

If the clear profits of the undertaking of the Company in any year amount to a larger sum than is sufficient to pay dividends on the then existing share capital of the Company at the authorized rate, the excess or such portion of it as is not carried to the depreciation fund (other than the renewal and depreciation fund) shall, subject as hereinafter provided, be carried to the credit of the divisible profits of the undertaking for the next following year. Provided that whenever the sum standing to the credit of such divisible profits shall exceed a sum equal to the amount which would be required to pay dividends on the share capital of the Company for the time being issued for one year at the authorized rate, the balance shall be applied, firstly, in filling up the reserve fund, and any balance remaining shall be applied in reduction of the price of gas. Within two years after the passing of this Act, the Company shall invest their reserve fund in accordance with section 31 of the Gas-Works Clauses Act, 1847.

Mr. VESEY KNOX took exception to the words after "excess"—viz., "or such portion of it as is not carried to the depreciation funds (other than the renewal and depreciation fund)." He contended that these words would remove any merit the clause had from the point of view of the Corporation. The law under the Gas-Works Clauses Act was that the whole of the clear profits after paying dividend were to be carried to the reserve fund, and really as it stood the proposed clause did in one sense give the Company an advantage which they had not got under the General Act, because it allowed them, in addition to accumulating their reserve fund, to accumulate the carry-over, which he contended was illegal. It was quite clear, under section 31 of the Gas-Works Clauses Act, 1847, that if the law was completely and absolutely carried out, there would be no carry-over at all. This, however, was not a practical thing as companies were worked now; and the Corporation were perfectly willing to meet the Company on this to the extent of a year's carry-over. On the question of depreciation, however, he submitted that something ought to be done to provide for depreciation before arriving at the profits of the undertaking. But the Company asked that the Committee should give legal authority to certain funds, unknown in law, called depreciation funds and renewals and depreciation funds. This, he contended, was not in accordance with the decision. If the Company got these words, they would be allowed to carry out of their profits as much as they pleased to any fund they chose to form, whether there was depreciation or not, and to the renewals and depreciation fund, whether required or not. The whole virtue of the clause from consumer's point of view would be gone. If the words objected to remained, it would be no good at all.

Lord LYTTON : What would be the position of these two funds if the words were struck out?

Mr. VESEY KNOX : I am of opinion that they are not legal; but if they are legal, they will still be legal. I propose that they should be left unaffected entirely by this provision.

The CHAIRMAN : In wording the decision, I was under the impression that if the whole of the profits were to be given over to the reserve fund, and then invested, it would be impossible for the Company to carry on its gas business, for you cannot carry it on without depreciation. The plant depreciates very rapidly; so that by putting in that there should be no other fund, I was under the impression that this would be to absolutely cripple the Company.

Mr. VESEY KNOX : That is not so. They have a right to depreciation; and the clause only deals with excess profits. They can make proper provision for depreciation before arriving at their profits.

Lord LYTTON : Your position is that the Company should not be free to carry an unlimited amount of their profits to these two funds?

Mr. VESEY KNOX : Yes.

Mr. SZLUMPER contended that Mr. Vesey Knox was endeavouring to revoke the Committee's decision. In this matter, they could not rely upon the Act of 1847, because it did not contemplate the changes which had taken place. The gas business now entailed large expenditure upon plant, slot-meters, &c., which rapidly deteriorated. It was absolutely necessary that the Company should have these funds, especially in an industrial district like Swansea.

Lord LYTTON : I do not appreciate the distinction between depreciated plant before you take profit, and carrying your profit over to a depreciation fund. If you can provide for your depreciation before you make out your profit, what more do you want? Why not insert the words, near the beginning of the clause, after "Company," "after making provision for depreciation?"

Mr. SZLUMPER accepted the proposed insertion.

The Committee approved the clause thus amended. It will read "If the clear profits of the undertaking of the Company, after making provision for depreciation, in any year amount to a larger sum," &c.

The Bill, as amended, was then ordered to be reported to the House for third reading.

CHAPEL-EN-LE-FRITH GAS BILL.

The promoters of the Chapel-en-le-Frith, Chinley, and District Gas Bill last Thursday made application to the Standing Orders Committee of the House of Lords for the suspension of the Standing Orders, so as to permit of the insertion of a provision in the Bill authorizing the Company to supply the area hitherto supplied by the Whaley Gas Company. It was explained that the Chapel-en-le-Frith Company had acquired the Whaley Company's undertaking.

The application was granted.

TAMWORTH GAS BILL.

The Charge for Gas in the Outer Area.

Among the Bills before the Unopposed Bills Committee of the House of Lords, presided over by the Earl of CAMPERDOWN, last Thursday, was that promoted by the Tamworth Gas Company.

Mr. GRAY (the Lord Chairman's Counsel) directed attention to clause 26 of the measure. He pointed out that this provision authorized the Company to charge a differential rate in the area outside Tamworth—this charge in no case to exceed the maximum of 5s. per 1000 cubic feet. Under the terms of the clause, the Company would be able to charge down to zero in Tamworth and yet be able to charge 5s. in the district outside. He put this as an extreme case; but it illustrated the defects of the clause. He reminded the promoters that the practice had been to limit the differential rate to a specified amount in excess of the price charged in the home area.

Mr. BAKER, Parliamentary Agent, concurred in this view, and intimated that the Company were quite prepared so to amend the clause as to provide that the price in the outside area should not be more than 6d. in excess of that charged in the borough.

Mr. GRAY said this would be satisfactory.

The Bill, as amended, was ordered to be reported for third reading.

METROPOLITAN WATER BOARD (NEW WORKS) BILL.

The Joint Committee of the two Houses of Parliament appointed to consider this Bill met again on Monday last week, under the presidency of the EARL OF KINTORE.

The CHAIRMAN, addressing Mr. Balfour Browne, K.C., the leading Counsel for the promoters, said it was common knowledge that a majority of the members of the Metropolitan Water Board had decided to withdraw what remained of the Bill. He thought that, before an irrevocable step was taken, it might possibly not be unwise on his part to suggest that an immediate decision should be postponed, and a little more time be taken for consideration. They had come to Parliament with a scheme of such magnitude that, if it had been allowed in its entirety, they would have been free from parliamentary control for thirty and possibly for forty or fifty years. It would have been improper for any Joint Committee to place them in such a position. A reason for delay was that further consideration must be given by the Committee to the Thames Conservancy Bill.

Mr. BALFOUR BROWNE said he was merely the mouthpiece of the Board; but if he might counsel them openly, it would be to invite them to ask the Committee to adjourn.

Mr. VESEY KNOX, K.C. (for the Thames Conservancy), said the Conservancy were prepared to accept the decision of the Committee, and did not see that the variations from the terms of the agreement between them would justify the Board in withdrawing.

Mr. BALFOUR BROWNE said the next Board meeting would be on the 19th of May; but an emergency meeting could be called.

The CHAIRMAN thought it was of sufficient importance to call an emergency meeting.

It was arranged that the Committee should meet again on the 17th inst. (to-morrow).

LEGAL INTELLIGENCE.

Conviction for Fraudulently Using Gas.

At the Old Street Police Court last Wednesday, before Mr. Biron, Frances Castleman, a middle-aged woman, of Hutley Place, Hoxton, appeared in answer to a summons taken out at the instance of the Gas-light and Coke Company for "improperly using gas," under section 18 of the Gas-Works Clauses Act, 1847. Mr. Humphreys, solicitor, said the defendant had a supply of gas laid on before Christmas last, and after some time, when a collector of the Company called on her, she said someone had broken open her meter, which was a prepayment one. No money was in the box, though the index showed that the quantity of gas consumed was worth £2 12s. 6d. The peculiar feature of the case was that the meter was only constructed to hold 35s. in pennies. Defendant subsequently admitted that she used to place a penny in the slot in order to procure a supply of gas, then take it out and put it in the slot again so as to obtain a further supply. She now admitted the offence, but denied that she broke open the meter. After a long legal argument as to whether or not a felony had been committed, and as to whether, in that case, it was the penny or the gas which had been stolen, the Magistrate said he thought the case came under the section of the Act cited, and that therefore the matter might be dealt with in accordance with the summons. He imposed a penalty of £3, or in default fourteen days' imprisonment.

Gas Workers' Wages at Sunderland.—Last Thursday, a deputation from the Gas Workers' and General Labourers' Union interviewed the Directors of the Sunderland Gas Company, on the question of an advance in wages all round, and with respect to holidays. The Directors intimated that, when compared with the rest of the North of England, the men had practically no claim to any increase of their present scale. However, as the Company were desirous of continuing the present harmonious relations, the Directors had decided to offer an advance of 1s. per week to yard labourers, main and service layers, shop and syphon men, and lamplighters; also to grant an additional half-holiday on August Bank Holiday. They further stated that they would allow time-and-a-quarter for overtime worked by the main and service layers and the shop and syphon men. They were, however, unable to advance the wages of the retort-house men. The report of the deputation will be considered at a full meeting of the employees.

MISCELLANEOUS NEWS.

MANCHESTER TRADING DEPARTMENTS AND THE RATES.

By a further pruning of the estimates, to the extent of just over £12,000, and extracting a further £15,000 from the trading departments, the Manchester City Council at last Wednesday's meeting managed not only to avoid any increase in the rates for the current year, but to effect a decrease on last year's figure by about ½d. in the pound. Contrary to general expectation, no further call was made upon the Gas Committee, whose contribution out of profits in aid of rates stands at £50,000, which is £3500 more than was given last year. The Electricity Department has to find out of profits an additional £5004, making the total contribution from it £24,500; and the Tramways Committee have to find £85,000, in place of £75,000.

At a largely attended meeting of ratepayers held on Tuesday evening at the Manchester Coal Exchange, the following resolutions were adopted: (1) "That, seeing the enormous growth in the expenditure of the City, and the failure of the Finance Committee effectively to control the same, this meeting asks for the creation of a strong and independent authority which at all times will keep the expenditure within the natural growth of the city rate." (2) "That this meeting strongly urges the Special Committee appointed to consider the contributions of the trading Committees to secure from each Committee at least a return of 3 per cent. on the capital borrowed on the credit of the ratepayers." Mr. C. F. Brierley, who seconded the adoption of the last resolution on behalf of the Manchester Property Owners' Association, of which he is Secretary, said that if this 3 per cent. were obtained the Council would be able to reduce the rates substantially.

BIRMINGHAM CORPORATION GAS DEPARTMENT.

Annual Accounts—Reduction in Price.

In the report which the Gas Committee of the Birmingham Corporation will present at a special meeting of the City Council to be held next Tuesday, they state that, in view of the satisfactory nature of the accounts of the department submitted with it, and the favourable outlook for the future, they have carefully considered the question of lowering the prices charged for gas; and they recommend that, after the June reading of the meters, the charges be reduced as follows:

For lighting, heating, and domestic purposes in one premises: Under 50,000 cubic feet per quarter, from 2s. 4d. to 2s. 2d. per 1000 cubic feet; 50,000 to 250,000 cubic feet per quarter, from 2s. 2d. to 1s. 11d.; and 250,000 to 1,000,000 cubic feet per quarter, from 1s. 11d. to 1s. 9d. In respect of each additional million cubic feet or portion thereof, a reduction on the total consumption of 1d. per 1000 cubic feet until a minimum rate of 1s. 3d. per 1000 cubic feet is reached.

For manufacture and motive power: Under a million cubic feet per quarter, 1s. 6d. per 1000 cubic feet. In respect of each additional million cubic feet or portion thereof, a reduction on the total consumption of 1d. per 1000 cubic feet until a minimum rate of 1s. 3d. per 1000 cubic feet is reached.

[Prices are subject to 5 per cent. discount for prompt payment.]

For supplies of gas through prepayment meters: With gas-fittings and cookers free, from 28 to 31 cubic feet per penny; with cookers only free, from 33 to 35 cubic feet per penny.

Few meter-rents are now charged; and the Committee recommend that, after the June reading of the meters, these rents should be abolished, except in cases where additional meters are required solely for the consumer's own purposes, and in other exceptional cases at the discretion of the Committee.

Accompanying the report are the accounts of the Gas Department for the year ended the 31st of March. They show that a sum of £30,744 was spent on capital account (£6873 of it being for extension of buildings, £8463 for new mains, and £14,144 for new meters not in place of old ones); bringing up the total expenditure to £2,491,711. Deducting the value of buildings and plant abandoned, £63,250, a sum of £2,428,461 is produced, which is £480,488 less than the total receipts (£2,908,949). The revenue from the sale of gas amounted to £743,046 compared with £702,879 in the preceding year; while residual products realized £265,342, against £231,445. The total receipts were £1,016,788, compared with £940,460. On the other side of the revenue account, under manufacture, coal (including oil, carriage, unloading, and all other expenses of depositing same on works) cost £377,968, against £372,759 the preceding year; purifying materials and wages, £8123, against £8200; wages at works, £76,438, against £76,888; and repairs, maintenance, and renewal of works, plant, retorts, machines, apparatus, and tools (less old materials sold), £179,207, against £147,416. The total cost of distribution was £81,582, compared with £63,506; and the remaining items brought the expenditure up to £805,034, against £750,526 in 1909-10. There is thus on the present occasion a balance of £211,754 to be carried to the profit and loss account, compared with £189,934 in the previous year. After meeting interest and other charges, there is a net balance of £75,621, which compares with £72,492 last year.

The quantity of coal carbonized in the past twelve months was 593,724 tons, and of gas oil used 3,403,721 gallons. The gas sold and consumed on the works amounted to 7,693,899,300 cubic feet. The average net price of gas was 1s. 11·18d. per 1000 cubic feet, compared with 1s. 11·41d. Coke and breeze realized £150,053; tar, £50,503; ammoniacal liquor, £64,492. The estimated quantities made were: Coke, 315,317 tons; breeze, 62,828 tons; tar, 7,190,574 gallons; ammoniacal liquor, 23,621,647 gallons. Of coke, 233,379 tons were sold, and 87,428 tons used.

The following are some statistics of the gas undertaking for the years ended March 31, 1910 and 1911:—

—	1910.	1911.	Increase.
Gas sold (cubic feet)	7,205,806,700	7,693,899,300	488,092,600 = 6·77 per ct.
New services laid	7,937	8,545	608
Cooking and heating stoves sold	572	741	169
Number of cookers supplied to prepayment consumers at March 31	56,046	63,460	7,414
Number of cooking and heating stoves on hire, do.	9,724	12,018	2,294
Number of prepayment meters fixed, do.	69,028	75,595	6,567

The contributions of the Gas Department for public purposes during the year were—

In aid of the improvement rate	£75,621
Do. (interest on reserve fund)	3,006
In aid of public lighting within the city	9,323
In aid of court lighting within the city	2,078
In aid of public and court lighting outside the city	4,564
	£94,592

A FURTHER REDUCTION AT WIDNES.

At the Monthly Meeting of the Widnes Town Council last Tuesday, there was some good news for the users of gas.

Alderman TIMMIS, the Chairman of the Gas and Water Committee, remarked that the estimates showed that during last year they had made a profit of £6572; but from this had to be deducted £2000 for public lighting—leaving a sum of £4572 to be dealt with. The Committee considered what was the best method of using this profit, so as to give the greatest advantage to the borough; and it was decided to offer a reduction to the consumers. To the ordinary consumers for domestic purposes, the price would be reduced from 1s. 2d. to 1s. 1d. per 1000 cubic feet; to large consumers, from 1s. to 11d.; and to consumers for motive power, from 10d. to 9d. In regard to slot-meters, the amount of gas supplied to them would be increased from 50 to 54 cubic feet for 1d. This was equivalent to 1½d., and it put them in exactly the same position as the ordinary domestic consumer. These figures were absolutely the lowest that had ever been put forward by a concern making gas from coal. The Committee proposed to give three days' free illumination of the town at Coronation time.

Mr. WELDING asked why the Committee should reduce the price to very large consumers, seeing that the cost of making and distributing the gas amounted to 11d. per 1000 feet.

Alderman TIMMIS said the policy of every gas undertaking had been to give a reduction to consumers of gas for motive power, for several reasons. The first was that it was an inducement to manufacturers to settle in their midst. Gas-works were put up primarily to supply domestic users; and it was necessary to put down mains throughout the whole town. There were standing charges which were put upon the work, and whether a thousand feet or a million feet were consumed, these charges would be there. It must not be forgotten, however, that these mains were only used, as far as domestic purposes were concerned, for about six hours out of the 24; and when they could get consumers to take gas continuously for the 24 hours, they were in a position to supply it at a lower rate, and by so doing they were reducing the standing charges. Were they that day to increase the price for motive power, the standing charges on the whole estate would go up, and at the next meeting of the Council the Committee would have to come forward with a proposal to put up the price of gas. The suggested reduction was equal to a sum of £1762.

Mr. WELDING accepted the statement; but he thought the Committee might take into consideration the question of whether it would not be wise to spend the profits on improving the light.

Mr. BEACHAM contended that there ought to be a more equal distribution of the profits by giving more benefit to slot-meter users.

Mr. CLARKE, however, pointed out that it would be unfair to provide meters and fittings for slot consumers, and give them the same advantage as other consumers.

ST. HELENS CORPORATION GAS UNDERTAKING.

Record Profits—Congratulations to the Engineer.

The Gas Committee of the St. Helens Corporation had presented to them at their meeting last Wednesday a highly satisfactory account of the working of the gas undertaking in the past financial year. The results were looked forward to with a considerable amount of interest, owing to the fact that the year was started with an increased price for coal; contracts having to be fixed soon after the Mines (Eight Hours) Act came into operation. The market prices of residuals, however, proved helpful to the excellent results obtained. The past year was a good one from the point of the production and sale of gas. There was an increased make to the extent of about 25 million cubic feet, or nearly 5½ per cent. more than in the year 1909-10. The financial result for the year constitutes a record; the net profits having been £11,984, or £2600 more than before. This was very satisfactory, and the Committee were hearty in their congratulations to the Engineer (Mr. Samuel Glover, M.Inst.C.E.) on being able to present such a report of another year's work of a great commercial department of the Corporation. They decided to hand over to the Finance Committee £5000 for the relief of the rates; and, in view of the extra expense to which the Corporation will be put during the Coronation year, to allocate another £1000 for the benefit of the special fund. The balance was voted to the usual

capital account of the gas undertaking, which helps the Committee to avoid the necessity of borrowing money for gas-works purposes.

At the meeting referred to, Mr. Glover was able to report the continued successful operation of the original setting of the Glover-West vertical retorts, which are now well in their third year of working, and which, upon a recent inspection of the interior, were found to be in a better condition than ordinary retorts after only a year's work. During the present year, some new vertical retorts will be put into operation, owing to the Committee having provided an extension of carbonizing plant by the erection, on a site in the Warrington Old Road, of forty retorts, capable of producing half as much gas as used to be made altogether in the old works—thus proving that a small area is most valuable for gas-making plant under the new system. It has enabled the Committee to dispense with the erection of new works.

Referring last Friday to the results of the past year's working of the gas undertaking, and to Mr. Glover's share in their production, the "St. Helens Newspaper and Advertiser" said: "At the meeting of the Gas Committee the other day, reference was made to the fact that the Gas Engineer, Mr. Samuel Glover, has completed forty years' service at the works, while at the same time he is in his twenty-fifth year as Engineer and Manager, which would appear to be somewhat unique. It is a remarkable fact that this happens in the year when the gas-works under his control have made a record profit. Mr. Glover entered the service of the old Gas Company many years before it was taken over by the Corporation, and when under the management of the late Mr. William Pritchard. The Committee testified their appreciation of Mr. Glover's faithful services, and expressed the hope that he would continue to serve them for many years to come. He has always taken the keenest possible interest in the works under his charge; and the continued success of this important department of the corporate estate must in great measure be attributed to his devoted services. Mr. Glover occupies a foremost position in the gas world to-day. He has recently been admitted a full member of the Institution of Civil Engineers; and he is the immediate Vice-President of the Manchester District Institution of Gas Engineers. His name will be associated with one of the most remarkable developments in modern gas manufacture, of which St. Helens will be able to take full advantage."

BURTON-ON-TRENT GAS UNDERTAKING.

The Annual Accounts.

At the Meeting of the Burton-on-Trent Town Council last Wednesday, the report of the Gas and Electricity Committee for the year ended the 31st of March was submitted.

The Committee reported that the results of the working of both the undertakings under their supervision in the past financial year might be again considered satisfactory. The gas-works revenue account showed that the total receipts were £59,453, and the working expenses, including £6959 for debt charges, £45,289; leaving a surplus of £14,164, or £1771 more than that for the year 1909-10. The surplus had been allocated as follows: Relief of the rates, £8750; new prepayment meters and fittings, £465; new stoves for prepayment consumers, £1690; to the reserve fund, £3259. The grant in aid of the rates is, with one exception, the highest ever made by the undertaking, and represents 6d. per 1000 cubic feet of gas sold. Though the prices of gas were reduced at the end of the June quarter last year by 2d. per 1000 cubic feet to ordinary consumers, and by 4d. to consumers on the prepayment system—representing a concession of £2555 for the three quarters of the year—the revenue from these two classes of consumers is only rather more than £848 below that of last year. This loss is less than it would otherwise have been in consequence of an innovation in the method of collecting the money from the prepayment meters, by which the whole of them were simultaneously emptied for the first time during March, with the result that about 4½ million cubic feet of gas, representing £675, went to swell the revenue for the year just ended, whereas under the old system it would have been carried forward into the new year. The unaccounted-for gas is consequently reduced to this extent. The abolition of meter-rents at the end of the June quarter represented a further concession of £420 to consumers by ordinary meters. The consumption of gas by slot-meter consumers was materially increased last year by the supply of large cooking-stoves. The first 1500 were fixed by the 31st of March, and 1000 more are being put in. Last winter, the mains were extended to the village of Stretton, and 25 customers, mostly on the prepayment system, were obtained.

With regard to the working, the new retort-house, an illustrated description of which was given in the "JOURNAL" for the 11th ult. (p. 106), was brought into use in October, and is working quite satisfactorily. The quantity of coal carbonized last year was 33,219 tons, or 260 tons less than in 1909-10; but the make of gas was 366,437,000 cubic feet, compared with 357,884,000 cubic feet, or an increase of 8,553,000 cubic feet. The make and sale per ton of coal were 11,030 and 10,206 cubic feet respectively; being increases of 340 and 326 cubic feet on the previous figures. The residual products sold were: Coke, 16,885 tons, or 10·1 cwt. per ton of coal; tar, 309,617 gallons, or 9·32 gallons per ton; and ammoniacal liquor, 745 tons, or 27·8 lbs. of sulphate equivalent per ton. The gross cost of gas was at the rate of 22s. 5·86d. per ton of coal, and 2s. 2·44d. per 1000 cubic feet of gas sold; the net costs being 12s. 6·72d. and 1s. 2·77d. respectively. The gross profit was at the rate of 12s. 8·61d. and 1s. 2·95d.; and after meeting loan repayments and interest, there was left, as already mentioned, a net profit of £14,164, or 8s. 6·23d. per ton of coal carbonized and 10·02d. per 1000 cubic feet of gas sold. The gross profit made was 9·49 per cent. on the capital outlay on the undertaking.

Alderman LOWE, the Chairman of the Committee, in moving the adoption of the report, said it was proposed to expend £2350 on a new meter and governor house. He reminded the Council that when the previous extensions were made at the gas-works, the Committee stated that it would be necessary to carry out this particular work. The new building which would have to be erected would probably cost £750, and the meter and governor £1650. When the Council's Consulting Engineer (Mr. J. F. Bell, of Derby) made an elaborate report on the subject, he went into the whole question of the stores, the workmen's mess-rooms, and the meter and governor house, and recommended that £8000 be laid out in remodelling. The Committee, however, felt that for the present they had spent enough, and therefore restricted themselves to what they believed was absolutely necessary. The meter it was proposed to construct would be sufficiently large to meet any increase in the consumption of gas up to 50 per cent. Alderman Lowe then proceeded to deal with the annual statement of the two undertakings. This, he said, was somewhat discounted by the fact that some two months ago he estimated the profits to be £14,000 from the gas and £2000 from the electricity undertaking. He was glad to say he was not far from being correct; the actual result being £14,200 from the gas and £2364 from the electricity works. These figures were most satisfactory; and he was sure the Council would congratulate the officials (Mr. R. S. Ramsden, the Assistant Gas Manager, and Mr. Thomas Hall, the Electrical Engineer) and the workmen in bringing them about. Having dealt with the electricity accounts, Alderman Lowe turned to those of the Gas Department. He pointed out that in 1908 he recommended the Council to incur the expenditure of a considerable sum on the remodelling of the gas-works. They had accordingly spent £35,000; and their Consulting Engineer guaranteed them a return of 10 per cent. on the outlay. In making the change, they took great pains that the best method of carbonizing should be adopted; and they went to Germany. Though they had been criticized, he was sure that the money had been well spent. Comparing the returns of the undertaking with those of five years ago, he said the make of gas had increased by about 20 million cubic feet; and they now sold 10,200 cubic feet of gas and 10 cwt. of coke per ton of coal carbonized, against 9500 cubic feet of gas and 6½ cwt. of coke. The price five years ago was 2s. 9d. per 1000 cubic feet; whereas last year it was 2s. 5¾d. In the period he was dealing with, the net profits had risen from a little more than £10,000 to upwards of £14,000. He thought these figures were most striking, and spoke for themselves. They had made concessions to the consumers of more than £5000; and but for these, the surplus profit, after meeting interest charges and repayment of loans, instead of being £14,000, would have been upwards of £19,000. Since the alterations were commenced, they had effected a saving to the extent of over £8000 a year, which, he thought, fully justified the policy adopted by the Committee. They had also been able to put to the reserve fund the sum of £3257; and this fund now amounted to nearly £9000.

Mr. A. B. WARDLE, the Vice-Chairman of the Committee, in seconding the motion, said the town owed a deep debt of gratitude to Alderman Lowe for the great interest he always showed in the successful working of the gas undertaking. Contrasting the condition of the gas-works now and a few years ago, he said that whereas then they were "a ramshackle lot of rubbish," they were now neatness and order itself, and in every way a credit to the town.

Other speakers referred to the excellent character of the report; and the Committee were congratulated on the results recorded.

A few questions having been put to Alderman Lowe, and replied to by him, the report was adopted.

CONGLETON CORPORATION GAS UNDERTAKING.

The Annual Accounts.

At a Meeting of the Gas Committee of the Congleton Corporation on Monday last week, the Chairman (Alderman Solly) stated that the income of the gas undertaking for the year ended the 31st of March was £9501, compared with £8507 in the preceding twelve months—an increase of £994. The net profit was £1514, against £747, or £767 more than before. The result of the year's working meant that, though £1250 had been paid over to the borough fund in relief of the rates, the unappropriated profits had advanced from £2263 to £2376, in spite of the fact that £151 had been carried to the credit of reserve fund and the provision of £473 made in respect of the year's depreciation. With regard to the working results, the quantity of gas sold was 51,640,700 cubic feet, against 46,890,600 cubic feet for the previous year, or an increase of 4,750,100 cubic feet; that used in the public lamps being 4,657,400 cubic feet, against 4,636,700 cubic feet. The total make was 60,520,800 cubic feet, against 55,913,800 cubic feet, or an increase of 4,607,000 cubic feet; while the gas unaccounted for was 3,522,300 cubic feet, against 3,673,700 cubic feet—a decrease of 151,400 cubic feet, or 5·82 per cent. compared with 6·57 per cent. Other details of the working results were given, prominent among them being that the make of gas per ton of coal carbonized was 11,660 cubic feet, against 11,560 cubic feet in the previous year, or 100 cubic feet more; and that the gas sold per ton was 10,980 cubic feet, compared with 10,800 cubic feet, or an increase of 180 cubic feet—both these figures constituting a record.

Referring to the foregoing results, Alderman Solly said it was a great pleasure to put on record so very satisfactory a state of things. The position of the gas-works was a great credit to the Manager (Mr. J. T. Broughton), who had not only kept the works up to the good condition in which his predecessor had left them, but had actually improved on the previous working results. The worth of Mr. Broughton, after the experience of just over twelve months, was now proved, and the appointment fully justified. They had all found him a most capable and pleasant official to work with. Alderman Solly reminded the Committee that Mr. Broughton was appointed at a salary which was much below that usually paid to gas managers; and he proposed that it should be increased by £35 per annum, rising by regular increments to a maximum which he stated. General satisfaction was expressed at the results that were submitted; and Alderman Solly's proposition was agreed to.

Gas and Meter Testing in London.—At the meeting of the London County Council last Tuesday, the estimates for the financial year 1911-12, which were passed, included £4210 and £9080 for salaries and wages in connection with gas and meter testing respectively.

ILKESTON CORPORATION GAS DEPARTMENT.

Annual Report of the Engineer.

According to the annual report of the Gas Engineer and Manager of the Ilkeston Corporation (Mr. F. C. Humphrys), the working statement for the year ending March last is remarkable, inasmuch as it is the first year in which the effect of the new works and plant recently installed has been shown in the accounts. Much of the plant has been in use the whole of the year, and all of it during part of this period. The quantity of gas made in the twelve months was 119,604,700 cubic feet, against 112,344,800 cubic feet in 1909-10—an increase of 7,359,900 cubic feet. This, following an increase of 4,133,800 cubic feet the previous year, shows that the additional works were needed to provide for the increased output.

The coal carbonized was 11,640 tons, compared with 11,420 tons before. The make of gas per ton increased from 9837 to 10,275 cubic feet; and that this result was obtained from a less expensive variety of coal is shown by the fact that, though the price of coal advanced by fully 6d. per ton, the cost was £5276, against £5548. Compared with the year 1909-10, when the old plant was wholly in operation, the saving on the year's working is equal to 637 tons of coal. Against this has to be put an increase in repairs and renewals amounting to £564. This, however, Mr. Humphrys explains, was mostly due to the large amount of work (usually charged to capital) which had to be done after the Contractors had completed their work—consisting of connections between the old and new works and mains, the erection and partial equipment of a machine-shop, &c.

The return for renewals was satisfactory, regard being had to the fact that the coal was less expensive. The coke sold amounted to 6008 tons, equal to 10·3 cwt. per ton of coal; tar, 145,728 gallons, or 12·5 gallons per ton; and sulphate of ammonia, 137 tons. The return for these products was £5341, against £4966 before. This amount exceeded the cost of the coal by £65—a somewhat unusual and very satisfactory result. The receipts for gas were £14,154, against £13,420, and with the residual and other sundry receipts amounted to £19,633. This leaves a balance of £8618, against £7756, and is the largest amount carried forward in the history of the undertaking. The balance in hand will permit, after the payment of interest and the usual additions to the sinking fund, of an increased allowance for depreciation, and the handing over of £1300 to the general district fund.

HAMPTON COURT GAS COMPANY'S NEW SHOW-ROOMS.

The new and handsome show-rooms of the Hampton Court Gas Company, situated on The Terrace, at the foot of Kingston Bridge on the Middlesex side of the Thames, were opened last Wednesday afternoon in the presence of a select representative company. The formality of unlocking the door and declaring the premises open was carried out by Mr. A. Goodman, the Chairman of the Directors, who found inside the principal show-room a number of fellow-Directors, officials, and others interested in the operations of the Company. Among those present were Mr. W. E. Price, the Engineer and Manager of the Company, Mr. W. C. Lamb, the Secretary, the engineers of neighbouring Gas Companies, and Mr. J. H. Johnson, who is to take charge of the new department.

The show-rooms contain a selection of the latest improvements in gas cookers and geysers by various makers, radiators, and stoves, with many artistic lamps for inverted incandescent burners. The company, under the guidance of Mr. Price, inspected the chief novelties; and interest centred upon the useful hot-water circulator for kitchen and bathroom use combined. A descent was made to the basement of the building to see the working of the Keith-Blackman high-pressure plant—a compact little engine with compressor, by which the front of the premises will be brilliantly lighted.

Refreshments having been served in an upper room, which is to be utilized for storage purposes, Mr. Goodman extended a welcome to the Company's guests. They would all agree with him, he said, that in the present day show-rooms were a necessity for a gas company to possess; and after having looked round for a long period, they had pitched upon premises which were unique. They were remarkably central, and accessible by tram from every part of the district. In their desire to extend the business of hiring-out gas-cookers and other useful articles, the Company were not acting in competition with tradesmen in the district; but it would be readily understood that a large company could deal direct with the makers, to the advantage of consumers of gas, and could keep up a large and varied show. In conclusion, he acknowledged the vast amount of work which Mr. Price had accomplished in connection with the arrangements of the show-rooms.

GAS LIGHTING OF ARTILLERY HEADQUARTERS.

A Fine Installation at Wolverhampton.

The lighting of the new headquarters of the Royal Field Artillery and Staffordshire Yeomanry shortly to be opened in Wolverhampton has been the subject of much consideration on the part of the officers and others concerned. At the entrance of both the riding-school and the drill-hall there is fixed a lamp of 450-candle power, worked on a new system of bye-passing. In the drill-hall a perfect blaze of light is supplied from twelve four-light lamps, at a height of 12 feet—having an illuminating power equal to about 7000 candles. The hall covers an area of 136 ft. by 48 ft.; and the cost of its illumination works out at only 6d. per hour, according to the Company's Fittings Superintendent (Mr. Coombes). The riding-school covers an area of about 144 ft. by 54 ft., and is lighted by twelve lamps at a height of 14 feet; having an illuminating power of 5400 candles. The lighting of the officers' quarters is operated from a switchboard; and all the lights or only sections can be used. The whole of the fittings, burners, and pneumatic arrangements (of an original design) were carried out by Mr. P. G. Winstanley, and approved by the Architect, Mr. Cowlishaw.

BOMBAY GAS COMPANY, LIMITED.

Excellent Report by the Board.—Capital to be Increased.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, Moorgate Station Chambers, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting and the certificate of the Auditors; and the Directors' report and accounts (a notice of which appeared in the "JOURNAL" for April 25, p. 247) were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that the report was one of the best the Company had ever had. In the first place, he would congratulate the shareholders—as the proprietors would doubtless congratulate the Secretary and the Board—on the fact that the Company were now occupying better offices than those they used to hold their meetings in. Then there was another matter for congratulation, in the fact that, for the first time for a good long while, they had their Engineer, Mr. A. R. Burch, over from Bombay; and he would no doubt be glad to answer any questions that the proprietors might put to him. The first item of importance to consider at a company's meeting was the progress of the business; and, in this connection, the shareholders would have seen from the report that there had been an increase of about 12 per cent. in the sales of gas. This further increase was very satisfactory, when they remembered for how many years they had stood practically at stagnation point. In round figures, the sales of gas for the year 1898 only amounted to a hundred million cubic feet; while they were now about eighty million cubic feet more than this. From this, they would see that the prospects of the Company were looking fairly bright, and that there was no exaggeration in his remark that the present report was one of the best that they had had. This gain had not been accomplished without a great deal of work. For instance, there had been 1050 ordinary consumers added during 1910, as well as 463 public lamps. Then there were much better furnaces, which were very well worked by the Company's efficient staff. Mr. Burch and Mr. Lane looked thoroughly after everything. They had sold 1066 tons more coke; but, unfortunately, there had been a fall in price of 1s. 5d. per ton. The report stated that the price of gas had been reduced by something like 8d. per 1000 cubic feet since the date of the last meeting. A reduction of 4 annas was mentioned in last year's report; and a further similar concession had been made as from Jan. 1 last. This was bound to inure to the benefit of the Company. It would tend to stimulate the consumption, and would strengthen them against competition; while at the same time the Board felt confident that it would not in any way interfere with the shareholders receiving a satisfactory dividend. Speaking personally—and not on behalf of the other Directors—he always thought that when two concessions were made to the consumers one should be made to the shareholders. Well, they could not go on increasing the consumers and selling all this gas without securing further capital; and it became a question for the Board as to how they were to obtain this capital. At various times, proprietors had asked them when they were going to make a further call in respect of the partly-paid shares; and his reply had been that, as long as the Company could borrow money at 3½ per cent., they were not going to pay 7 per cent. for it. But it was now necessary to do more than borrow from the bank. They had to find a large amount of money to enable them to carry on the business; and thus the time had arrived when they had to go into the question of raising capital. Then there ensued a discussion which very nearly split the Board to the foundation. The financial Directors were very keen that the Company should always obtain its money in the cheapest market; but others thought that after all the men who had held the partly-paid shares for a long time, and had stuck to the vessel right through, should have the benefit which they would enjoy through the calling-up of the remaining £1 per share. After some wavering, he (the Chairman) accepted the latter view; and he only hoped the partly-paid shares extended pretty well throughout the list of proprietors. Unfortunately, however, this piece of "bad finance" would not get them altogether out of the mud; and more money was still necessary. Therefore the Board were going to ask the shareholders to authorize them to call up further capital, in addition to making the £4 paid shares fully-paid. In calling up the £1 per share referred to, he must warn the shareholders that they would get no dividend upon this call except for the half year from June to December; and, of course, this would not be included in the dividend received next December. As to the date for paying dividends generally, it was hoped in future to secure an acceleration of six or seven weeks, so that the shareholders would receive their June dividends at the end of October. It was also the intention to hold the meeting a month earlier. There was now a highly efficient staff in Bombay and London; and the Board foresaw no difficulties in carrying on the Company's business rather more promptly than in the past. The report stated that the profit on this occasion enabled them to pay the dividend of 7 per cent. recommended, and leave a balance of nearly £1000 more than a year ago. He was jealous about profits, because he did not like to show a profit unless he felt perfectly satisfied he had kept his works up; and keeping up works in Bombay was a very expensive thing. Everything purchased in this country had to bear a very heavy freight, and a great many charges, which constituted anything but a light burden. In this connection, he would like to say that the profit shown had not been arrived at this year without spending on repairs and maintenance of works and mains in Bombay—indoor and outdoor—the large amount of £16,300. The year before that the figure was £12,000; and in the immediately preceding years, £12,500, £9800, £6000, and £7300. This was going back to the time when Mr. Burch first went to Bombay. Mr. Burch was not only inexorable in asking for further plant; but he kept on improving the plant he had got—which was the real secret why they had spent this large amount of money on the works. Looked at in another way, this expenditure meant that the capital was not being exaggerated unduly, in spite of the great advances in the business, especially since Mr. Burch had been in Bombay. In fact, the effect of this self-denying ordinance in taking profits to keep up the works, would be best illus-

trated by the statement that whereas when Mr. Burch went out the capital was £1830 per million cubic feet of gas sold, it stood at only £1300 at the end of last year's business. When he told them that it took more money to pay the dividend in some foreign companies than to buy the coals, they would know how important it was to see that the dividend charge did not place too great a burden on an undertaking. The outstanding item of the accounts was that they had expended during the year £8031 on capital account. On necessary new buildings and plant there had been spent £3830; on new and additional mains, services, &c., £2690; and on new and additional meters, £1511. This was in addition to the large sum spent on the upkeep of the works, some of which a less rigorous Board would have put down to capital. The remainder of the accounts was somewhat similar to the previous year. A sum of £685 had been placed to the reserve fund, as on the last occasion. The concern had grown largely; and it was under very capable administration. Mr. Burch was an old pupil of his at Uxbridge. He had taken the man he thought most likely to serve the shareholders and to co-operate with the Board on lines that would be approved by all. Well, they would felicitate Mr. Burch on having won his spurs on the field in India, as they would no doubt commiserate with him on the fact that he had left his young wife in a grave there. He felt sure Mr. Burch would have as much sympathy from the shareholders in his trouble as he had gratitude from them for the good work he had done. He moved, in conclusion, the adoption of the report, also the payment of a dividend of 4 per cent. free of income-tax, making 7 per cent. for the year.

The DEPUTY-CHAIRMAN (Mr. W. G. Bradshaw) seconded.

Mr. H. R. SIBSON thought they might heartily congratulate both the Board and themselves upon the highly satisfactory position in which the Company stood that day. Not only had the dividend been maintained, but the works had been kept in an excellent state of efficiency, and they carried forward £1000 more than was brought in. Shareholders who expected more than this, must be hard indeed to please. He observed one item in the accounts which was perhaps a source both of astonishment and admiration. For the first time there was incorporated the amount of gas sold. Working out the yield per ton of coal carbonized, he was bound to say that the figures were astounding. They showed that there was the most extraordinary perspicacity on the part of the Board in purchasing coal; that there was an excellently equipped plant; and that there was some astonishing work in the retort-house. He thought the figures were almost phenomenal in the gas industry, and calculated to make the mouths of many gas managers water. He was glad Mr. Burch was with them so as to hear first-hand the expression of the shareholders' great appreciation of the work he had done for the Company in Bombay. The forward policy initiated some time ago, had resulted in a way that some of the proprietors did not anticipate; and the manner in which Bombay had responded to this policy, by increasing the consumption of gas, was quite a matter of surprise to those who were connected with the undertaking before. He knew that all the gas companies which their Chairman supervised were exceedingly successful; and he was sure that the progress of the Bombay Company must be gratifying to Mr. Jones. In Mr. Dickson, too, they had an able and painstaking Secretary; and the Company were fortunate to have such officers and such a Board.

A SHAREHOLDER inquired in what securities the reserve fund was invested.

The CHAIRMAN replied that for the most part it was in the business. The Directors did not see the use of putting it in Consols at $2\frac{3}{4}$ per cent., and then raising capital at 7 per cent. or borrowing from the bank.

Mr. CUFF also congratulated the Board on the report, and said that, looked at from the point of view of gross revenue, it was the very best they had ever had. Had it not, however, been for the satisfactory explanations about the outlay on the other side, he would have qualified the measure of his approval, because they had really expended all the increase they had gained. But he gathered that this matter of expenditure was not likely to bear the same proportion in the present year; so that he hoped the Board would still be able to maintain the dividend, notwithstanding the increase that was going to take place in the capital. On the credit side of the balance-sheet, under the item of "Sundries," there was the large amount of over £3000, as against £70 last year. Possibly the Chairman could tell them what this consisted of.

The CHAIRMAN explained that Mr. Burch had established a big showroom and shop, as was done by gas undertakings in this country; and this branch did a very extensive business. On the credit side of the account, as against expenses of fittings and maintenance, there was the considerable sum of over £2000 of profit actually made. On the quarter-day, this amount was owing for fittings; but since then it had been mostly paid.

The resolution was then carried unanimously.

The retiring Directors (Mr. Charles Hunt and Field-Marshal Sir Evelyn Wood, V.C., G.C.B.) were next re-appointed, on the proposition of the CHAIRMAN, seconded by the DEPUTY-CHAIRMAN; and the Auditors (Messrs. S. Gore Browne and J. Hill Perrins) were re-elected, on the motion of Mr. SIBSON.

An Extraordinary General Meeting.

An Extraordinary General Meeting was then held at which the following resolutions were submitted: (1) That the capital of the Company be increased from £250,000 to £300,000 by the creation of 10,000 new ordinary shares of £5 each. (2) That the Directors be, and they are hereby, authorized to issue such shares by tender or otherwise, at such time or times and to such persons as they may deem expedient, and, if thought fit, upon the terms that the full amount of each such share, together with any premium thereon, shall be payable immediately upon allotment.

The CHAIRMAN, in moving the adoption of these resolutions, said he had already explained the position. The capital had been over-spent —it was the work of several years—by £17,500, the greater portion of which was on temporary loan from the bank. On this the Company were paying good round interest, so that it would not burden the concern very much to pay the difference between the bankers' interest and the ordinary dividend on the capital they might call up. The Board would not call up any more capital than they needed; but he was sure the shareholders would not wish to check the splendid tide of prosperity of the business in Bombay by failing to keep the plant in a condition to meet all possible requirements. The intention was to issue a circular to the shareholders pointing out the facts of the case. At the moment, the Board did not see any necessity to employ more than the proceeds from 2000 £5 shares. As he had said, the capital account was overdrawn by £17,500; and the call on the partly-paid shares and the 2000 new shares would give them some £20,000.

The DEPUTY-CHAIRMAN seconded the propositions.

Mr. CUFF said that, other things being equal, he supposed the Board would favour applications from shareholders in preference to outsiders. They were sure to get a premium, which would make the amount realized more than £20,000. Was the increase in consumption, so far as the Company had received reports, still going on?

The CHAIRMAN: Yes; it is absolutely going on. It is most exhilarating to an old administrator like myself to get the reports we are receiving. The increase is well maintained. The Directors will consider they have an instruction, where factors are equal, to give preference to shareholders rather than to outsiders.

Mr. A. W. OKE remarked that he had had some hopes that the Directors might see fit to issue these shares at par to the proprietors. If, however, they could not do this, perhaps they would issue them as £4 paid, so that this would some day (when they were made fully-paid) furnish a bonus.

The CHAIRMAN replied that the shareholders were now all on a level; and it was a duty to the undertaking to obtain new capital, with fair consideration to the shareholders, on reasonable terms. There would be a minimum price fixed.

The resolutions having been unanimously carried,

Mr. OKE proposed a hearty vote of thanks to the Chairman, Directors, and staff. The undertaking was, he said, being conducted in a way to benefit, not only the shareholders, but also the consumers.

The vote was cordially passed, and

The CHAIRMAN acknowledged it; remarking that the staff especially deserved their thanks. Mr. Burch had realized the very best anticipations entertained by the Board when they appointed him. He had borne his part in a manly way, with a good many difficulties against him, and in a country where there was much in the way of climate to contend with. He had a competent seconder in Mr. W. T. Lane; and the Board had sent him out some capable young officers, of whom he reported very well. Thanks were due to them, and also to their other servants (the natives), who were dutiful, intelligent, and industrious, and did all they could, in their various small spheres, to promote the prosperity of the Company. Then in London they had the advantage of the able services of Mr. Dickson, who possessed many good qualities. The Board felt sure they had the concurrence of the shareholders in so arranging matters as to promote the comfort and happiness of their staff, and in rewarding them according to their merits. Living was, of course, very different in Bombay from what it was here; and the Directors kept an indulgent eye on the officials.

Mr. BURCH assured the shareholders that they had a very fine business. The island of Bombay was extending very rapidly. A large reclamation scheme was about to be taken in hand by the Government. Practically the whole of the southern half of the island was covered with buildings; and a big Improvement Trust were going to develop the other half. They had a good field in the town as it existed now, for there were miles and miles of streets in which the shops were lit by oil, all of which the Company would get; and, in addition, there was the enormous development which was bound to take place in the north of the island. India, as a commercial country, was only in its infancy. The port of Bombay was going to extend, he thought, in a marvellous manner; and they need not fear in the least degree for the future of the Company. The country was, however, very subject to disease of all kinds; and this might occasion temporary setbacks. But they would be only temporary; and of the prosperity of Bombay and of the Company he felt certain.

Mr. DICKSON also briefly returned thanks.

PRIMITIVA GAS COMPANY OF BUENOS AYRES, LIMITED.

The report for the year 1910, to be presented to the shareholders at the tenth annual general meeting, to be held to-day (Tuesday), states that the balance of the revenue account and the interest received from the German Transatlantic Electricity Company amounted to £368,534; and the receipts from other sources were £4378, to which had to be added the amount brought forward from the last account, £57,323, or a total of £430,235. The debenture interest was £45,820; the sinking fund for the River Plate and Buenos Ayres (New) debenture stocks amounted to £6000; and interest, discount and commission, depreciation of investments, income-tax and London expenses were £33,421. Two dividends (each of 2s. 6d. per share, free of income-tax) were paid on July 1, 1910, and Jan. 1, 1911, on the preference shares of the Company—amounting to £122,750; while the interim dividend of 3s. per share (free of income-tax) paid Nov. 1, 1910, on the ordinary shares of the Company absorbed £34,500. These amounts totalled to £242,491; and left a balance to the credit of profit and loss of £187,745. The Directors now recommend that a final dividend of 5s. per share (less income-tax), making a total distribution of 8 per cent. for the year, be paid on the ordinary shares of the Company, which will absorb £61,250; that to the reserve fund, £30,000 be transferred; to the pension fund, £5000; to the Retiro works amortization account, £35,000—together, £131,250; leaving to be carried forward, £56,494.

The report continues: Since Dec. 31 last, 5000 ordinary shares have been sold on the market; and these will participate in the final dividend, provision for which has been included in the foregoing statement.

The profits for the year were unfavourably affected by the high rates of freight paid on coals and materials shipped to Buenos Ayres; but the business continues to expand. The demand for cooking-stoves and heating appliances continues to show a steady increase. The net-work of mains was increased during the year by over 33 miles—making a

total of 1011½ miles. The Company's works have been maintained in efficient repair out of revenue.

A complete re-valuation of the whole of the properties of the Company has been made. In the case of land, houses, &c., the valuations have been made by expert valuers; and in the case of the plant, by the Company's Engineers. The result of this re-valuation is shown in the balance-sheet.

In accordance with the agreement with the Municipality of Buenos Ayres, the Retiro works have been dismantled, and the land has been handed over to the Municipal Authorities. It is the Board's intention to amortize the value of land, works, connections of mains, and expenses entailed by the amalgamation—amounting together to £715,142—during the twenty years over which the present concession extends. A provision of £35,000 has, therefore, been made out of the Company's profits for the year under review.

CAPE TOWN AND DISTRICT GAS COMPANY, LIMITED.

Annual Report and Accounts.

At the Ordinary General Meeting of the Cape Town Gas Company to-morrow, the Directors will report that the result of the working in the year ended Dec. 31 is a profit of £16,603, being an increase of £722 compared with the preceding year. Adding the sum of £1761 brought forward, there is produced a total of £18,364. Out of this sum, interest on debentures accrued to Dec. 31 has been provided; £4500 has been written off capital account, and £2000 transferred to the reserve and contingency fund; and there remains a balance to be carried forward. As stated to the shareholders last year, the contract for lighting the streets in the Municipality of Seapoint terminated on Dec. 31, 1909. The capital expended in providing and fixing the lamps and fittings for this purpose, therefore, ceased to be profit-earning. The Directors express regret that they are unable to recommend the payment of a dividend, as there are still some floating loans to be repaid, and it is indispensable that funds should be available to increase the supply of fittings and automatic meters, for which there is still a demand, and on which the Company so largely depend for the maintenance and increase of their business. The number of consumers (including those supplied through prepayment meters) increased from 5764 in 1909 to 6113 at the end of 1910; but the average receipts per consumer are again lower, though great care is taken to avoid as far as possible expenditure on any houses where the use of gas would be insufficient to give a reasonable return on the outlay incurred. During the past year the competition of the municipal electricity undertaking became still keener, both as regards price and the extension of the districts in which it is supplied. The loss of the street lighting contract at Seapoint, and the reduction the Directors have had to make in the price of gas for power purposes in order to retain the Company's customers, have diminished the receipts for gas; but the returns from the sale of residuals have increased.

HOT-WATER STORAGE TANKS.

This was the subject of a lecture delivered at Hackney recently to foremen and fitters in the employ of the Gaslight and Coke Company, by Mr. Frederick Dye, on behalf of Messrs. John Wright and Co., Limited. He pointed out that every hot-water apparatus erected for domestic supply—that is, the supply of hot water at taps—requires a storage-tank. When this is situated at or near the top of the house, it is square or rectangular; but when it is in or near the kitchen, it is usually of cylindrical form. The shape of the tank makes no difference to the circulation or the efficiency of the apparatus in heating the water. The square form is the cheapest to buy, has the best appearance, occupies the least space, and is the easiest to handle; and people would use these for preference if they could. The reason that the square tank cannot always be employed is that it does not bear pressure successfully; and whenever the pressure of water is more than a few feet, the cylindrical form of tank has to be adopted. The pressure of water in pipes is 1 lb. per square inch for each 2 ft. 4 in. vertical height. Only vertical distance from the level of the cold-water cistern to the level of the tank has to be considered, regardless of whether the cistern is directly over the boiler or some distance away in a horizontal direction. The size of the cold-water supply-pipe from the cistern to the tank makes no difference, nor does the size of the cold cistern. All that has to be ascertained is the vertical distance stated, and 1 lb. pressure allowed per square inch for each 2 ft. 4 in. in height. This figure is an awkward one for quick calculations; consequently it has become the common rule to allow that each 2 feet height is equal to 1 lb. pressure, or ½ lb. per foot. It is not correct; but it errs on the safe side, and never causes serious difference. To make things even more simple, it is a common practice, when inspecting houses of ordinary build, to allow that each floor is 10 feet, so that it is only necessary to know how many floors there are from cistern to tank to allow 10 feet, or 5 lbs. to each, and the figure is arrived at in a moment. When ordering a tank, it is necessary to know the pressure it will have to bear; and the makers' lists give the tested pressures of the various qualities. That the pressure is very real can be readily understood by ascertaining the number of square inches that the water presses against a tank. A tank of square form, measuring 2 feet each way (holding 50 gallons), has 3456 square inches in it, which, with a pressure of 15 lbs. to the square inch (35 feet head of water), means a total pressure of nearly 52,000 lbs. This is more than a square form of tank of best quality will bear; and though it might not burst, it would have its rivets and joints started, and would leak. It follows, therefore, that, in ordering a tank for a domestic hot-water installation, the pressure must be ascertained, and a tank of proper shape and thickness of plate be ordered according to the makers' catalogue.

The foremen, fitters, and outdoor staff of the Ilford Gas Company assembled last Tuesday afternoon to hear a discourse on hot-water work, delivered by Mr. Frederick Dye. This is a further instance of the strong belief of Messrs. John Wright and Co. in the future of water heating by gas, and their policy of promoting its use for the purpose by imparting to gas companies' officials a knowledge of the work.

A POETIC APPEAL ON BEHALF OF GAS.

In order to popularize the use of gas, the Gas Department of the Perth Town Council have resolved to supply cooking and heating appliances on loan, free of rent, to approved ordinary and prepayment meter consumers, subject to the suitability of the premises and the interior fittings, and on certain specified conditions in regard to the minimum quantity of gas which the consumer is expected to use with the particular appliance selected. As this is much below the average consumption with similar apparatus at the present time, the new scheme is a real concession; and hope is expressed that gas consumers and inhabitants of the city generally will take the fullest advantage of the facilities offered to them. In order to enable them to inspect and ascertain the capabilities of the various kinds of appliances, the department are prepared to lend under the new arrangement, a stoves and lighting exhibition was arranged last week, in the new City Hall, by the Gas Engineer and Manager, Mr. W. B. M'Lusky. In addition to circulars furnishing particulars of the department's scheme, Mr. M'Lusky distributed the following lines, which were jotted down, by way of diversion, by Mr. Daniel Macfie, of Edinburgh. The source of the author's inspiration will be readily recognized.

A BURNING QUESTION.

To cook, and *how* to cook, that is the question:
Whether 'tis better in the heat of summer
To have the kitchen like a furnace heated;
Or to discard the coal-range blazing fiercely—
Its troublous flues, its smoke and dust and ashes—
And to adopt the cleanly gas appliance,
Which, by the turning of a tap is ready
To roast or boil, to bake or grill, at pleasure,
And in perfection?—'tis a transformation
Devoutly to be wished. To cook, at will,
At will! adjusting heat as need requires:
For in a kitchen cool the work is done
With ease and comfort, and with quick despatch
When gas is used. And then as to the cost:
The charge is for the gas consumed—no more!
The apparatus and its fitting free!
Free boiling-rings, free grills and cookers too.
Besides, the gas is cheap, healthy, and clean,
And ever at command by day or night.
Who then would bear the trouble and the cost
Of wasteful ranges burning all the day!
Now dying down, and now again replenished,
But seldom giving forth an equal heat
To do the needful at the appointed hour?
Why bear the ills the use of coal involves
When gas is offered as a public boon,
Free from all risk of disappointing failure?

ELECTRIC LIGHT EXTENSION AT HASTINGS.

Local Government Board Inquiry.

At the Town Hall, Hastings, on the 5th inst., Mr. T. C. EKIN, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, with reference to an application by the Hastings Corporation for authority to borrow £1189 for electric lighting purposes. The application was opposed by the Gas Company, who were represented by Mr. F. W. COLES with whom was Mr. F. W. BOTLEY; Mr. C. E. Botley, their Engineer and General Manager, and Mr. Charley F. Botley, Assoc.M.Inst.C.E., the Assistant Engineer, being in attendance.

Mr. *G. R. Butterworth* (the Borough Accountant), in answer to the INSPECTOR, said that in the year ended March 31, 1910, the amount raised out of rates for electric lighting was £2919; but for the year ended March 31 last the deficiency would be about £1900 or less. The gross income showed an increase of £944. Asked if he could say why there were such large deficiencies in 1908-9-10 compared with previous years, he said it was attributed largely to the introduction of Osram lamps.

Mr. *R. F. Ferguson*, the Electrical Engineer to the Corporation, in reply to Mr. COLES, said the metallic filament lamps reduced a consumer's bill by about one-third of what it formerly was. He denied that the Corporation were supplying current at a loss. The object of the main was to supply the Workhouse with electric light. There was no absolute agreement in existence yet, though it had been sent to the Guardians for approval. It was proposed that the Guardians should take the light for a guaranteed period of five years, with twelve months' notice on either side. He did not know anything about the agreement with occupiers. Mr. Coles remarked that the Corporation had been rather unfortunate in their prospective agreements, and he did not wish them to get into difficulties again. Witness replied that they would not do that. They were not supplying electricity at a loss, though with the sinking fund the undertaking showed a loss.

In reply to Mr. COLES, the Borough Accountant said there was a deficiency, after paying sinking-fund charges, which amounted to 1d. per unit for the year ending March 31, 1910. The customers had increased ever since the undertaking was acquired by the Corporation. In about two years, if all went well, he hoped that there would be no deficiency.

Alderman *Chesterfield*, the Vice-Chairman of the Electricity Committee, supported the application, and said the majority of the Committee were keen business men. Every year showed improvement in the undertaking. They appreciated the Gas Company's efforts to keep their fat concern still fat. The Company did not consider the ratepayers when they moved their works beyond the borough boundary, thereby saving thousands of pounds in regard to coal-dues. He submitted that the ratepayers got much better value from the Company than they might have done had there been no competition.

Mr. COLES said that the Company had no desire to embarrass the

Corporation in carrying on legitimate business. The Company were continually harassed to remove their works, and at the first opportunity they did so. Now people turned round and said they ought not to have moved. The Company came there to represent the ratepayers' point of view. If the Electric Light Committee would increase their price for current to private consumers, they would have no loss on the undertaking. At present the ratepayers were paying instead of the consumers.

Alderman *Tree*, as Chairman of the Finance Committee of the Corporation, said that an increased price of current would throw off a number of consumers, who would at once use gas instead of electric light.

Dr. *A. Scarlyn Wilson*, the Medical Officer of Health, supported the application on the grounds of cleanliness, convenience, and health.

In answer to Mr. COLES, witness said he was not aware that many eminent authorities preferred gas.

Some amusement was caused by one of the Guardians saying he was not in favour of electric light in the Workhouse, and that the whole scheme had been engineered by one or two Guardians "who were also councillors." Another Guardian thereupon said he was in favour of it, especially as some of the rooms were low-pitched.

Mr. *C. F. Botley* said he knew of several expert opinions absolutely contrary to the suggestion that electric lighting was more healthy than gas. He instanced the Society of Medical Officers of Health of London in support of this statement.

The inquiry then closed.

SLOW PROGRESS OF ELECTRICITY UNDERTAKINGS.

In the course of a paper, on "Savings and the Social Welfare," read recently by Mr. George Paish, the Editor of the "Statist," before the Sociological Society, he referred to the large amount of British capital which, invested in other countries, had benefited the world at large.

In the course of the discussion on the paper, Mr. Chiozza Money expressed the opinion that too much capital was allowed to leave this country, in view of the outlets it afforded for its productive utilization at home. It was the investment of the individual which frequently benefited society; but obstacles were placed in the way of the capital of the individual being used to the best possible advantage in developing home enterprises. What, he asked, was the cause of the slow progress of electricity in this country? It was to be found in the vested interests of enterprises which electricity would ultimately replace. The gas company, with its numerous shareholders, the municipal corporation, in owning and controlling a gas-producing undertaking, and kindred interests, put forward their claims for consideration which were seldom ignored when competition threatened them. In other words, a large amount of capital had been sunk in an industry which was rapidly becoming obsolete. This consideration was allowed to bar the progress of a newer and more efficient enterprise. Mr. Paish differed from the speaker in the views he had expressed. Gas, he said, was cheaper in England than in any other part of the world. The coal from which it was manufactured was easily and economically obtained. There was not, therefore, the same inducement here to establish electrical installations as there was in other countries where fuel was dear, and current could be produced very cheaply in a variety of ways—often by water power.

IPSWICH CORPORATION WATER SUPPLY.

Annual Report of the Water Engineer.

The Water-Works Engineer of the Ipswich Corporation (Mr. C. W. S. Oldham) has presented his report for the year to the 31st of December last; and it lately came before a special meeting of the Town Council. It shows that the total quantity of water pumped from the wells was 527,316,000 gallons; being nearly 19 million gallons more than that raised during the preceding year. These figures, together with 73 million gallons derived from the gravitation sources, gave a total of 600,316,000 gallons. This quantity was the whole of the water supplied for domestic and trade purposes during the year. The average consumption per head per day, including metered trade supplies, was 21·5 gallons, against 20·9 gallons for the previous year. The average consumption, excluding the trade supplies, was 16·7 gallons, against 16 gallons. During the year, a 24-inch trial borehole had been sunk to a depth of 302 feet at a site situated in the parish of Whitton. It was tested by pumping, with satisfactory results, both as to the quality and quantity of water obtainable. Parliamentary powers have been sought to authorize the Council to carry out the work of erecting a permanent pumping-station on the site. The various collecting areas of gravitation sources of supply were all carefully attended to during the year. The flow had been periodically gauged; and the Engineer estimated the quantity of water derived from these sources at 73 million gallons. Samples of water for analysis had been periodically taken by the Public Health Department; and in every case favourable reports had been obtained. Mr. R. G. Bennett, in proposing that the accounts and report of the Water Committee be received, said he thought the town was to be congratulated on the increase of £668 in the gross profit, which was now £12,346. If the undertaking had been a trading company, this would have represented a dividend of about 7 per cent. The report was received.

Water Divining Experiment at the Chertsey Workhouse.—On Monday last week, Mrs. M. Chinchen, a lady possessing the power of water divination, indicated, by means of the usual hazel twig, a spot in the grounds of the Chertsey Workhouse where she said water would be found; her husband stating that it would be about 30 feet beneath the surface.

Liverpool Gas-Fittings Company, Limited.—At the annual meeting of this Company on the 24th inst., the Directors will report a net profit of £1500 on the working during the twelve months ended Dec. 31. There is a sum of £1648 to the credit of the profit and loss account; and the Directors recommend a dividend of 10 per cent. for the year, with a bonus of 1s. per share (free of income-tax). After these payments, there will be a balance of £148 to be carried forward.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 434.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
1,551,868	Stk.	Apl. 12	5	Alliance & Dublin Ord.	83—86	..	5 16 3
374,000	Stk.	Jan. 13	4	Do. 4 p.c. Deb.	95—97	..	4 2 6
200,000	5	May 12	7	Bombay, Ltd.	6¼—6⅜*	..	5 3 8
40,000	5	,,	7	Do. New, £4 paid	5¼—5⅜*	..	4 15 4
50,000	10	Feb. 24	15	Bourne-) 10 p.c.	28—29	..	5 3 5
311,810	10	,,	7	mouth Gas) B 7 p.c.	16—16½	..	4 4 10
75,000	10	,,	6	and Water) Pref. 6 p.c.	14½—15	..	4 0 0
380,000	Stk.	,,	12½	Brentford Consolidated	257—262	+2	4 15 5
330,000	,,	,,	9⅜	Do. New	200—205	+1	4 12 8
50,000	,,	,,	5	Do. 5 p.c. Pref.	122—124	..	4 0 8
206,250	,,	Dec. 15	4	Do. 4 p.c. Deb.	99—101	..	3 19 3
220,000	Stk.	Mar. 10	11	Brighton & Hove Orig.	217—220	+2	5 0 0
246,320	,,	,,	8	Do. A Ord. Stk.	157—160	..	5 0 0
490,000	20	Apl. 12	11⅞	British	43½—44½	..	5 5 7
120,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb. Stk.	96—98	..	4 1 8
109,000	,,	Feb. 10	6	Bromley, A 5 p.c.	116—118	..	5 1 8
165,700	,,	,,	4½	Do. B 3½ p.c.	87—89	..	5 1 2
82,278	,,	,,	5½	Do. C 5 p.c.	106—108	..	5 1 10
55,000	,,	Dec. 30	3½	Do. 3½ p.c. Deb.	84—86	..	4 1 5
250,000	Stk.	,,	4	Buenos Ayres 4 p.c. Deb.	96—98	..	4 1 8
100,000	10	—	—	Cape Town & Dis., Ltd.	3—4	−⅛	—
100,000	10	—	—	Do. 4½ p.c. Pref.	6—6½	..	—
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	—	..	—
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	88—90	..	5 0 0
157,150	Stk.	Feb. 24	5	Chester 5 p.c. Ord.	109—111	..	4 10 1
1,513,280	Stk.	,,	5/9/4	Commercial 4 p.c. Stk.	113—116	..	4 14 3
560,000	,,	,,	5½	Do. 3½ p.c. do.	108—110	..	4 16 11
475,000	,,	Dec. 15	3	Do. 3 p.c. Deb. Stk.	77—79	..	3 15 11
800,000	Stk.	,,	4	Continental Union, Ltd.	95—97	..	4 2 6
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—138	..	5 1 5
492,270	Stk.	—	5½	Derby Con. Stk.	122—124	..	4 8 9
55,000	,,	—	4	Do. Deb. Stk.	104—105	..	3 16 2
148,995	,,	Apl. 12	5	East Hull 5 p.c. Ord.	—	..	—
840,150	10	Jan. 27	10	European, Ltd.	19—20	..	5 0 0
16,179,445	Stk.	Feb. 24	4⅝	Gas-) 4 p.c. Ord.	105½—106½	..	4 7 7
2,600,000	,,	,,	3½	light) 3½ p.c. max.	85—87	..	4 0 6
4,062,235	,,	,,	4	and) 4 p.c. Con. Pref.	102—104	+1	3 16 11
4,531,705	,,	Dec. 15	3	Coke) 3 p.c. Con. Deb.	79½—81½	+½	3 13 7
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	94—96	+2	5 4 2
82,500	,,	,,	6½	Do. do. 5 p.c.	—	..	—
70,000	10	Apl. 27	11	Hongkong & China, Ltd.	17—17½	..	6 5 8
131,000	Stk.	Mar. 10	7⅜	Ilford A and C	146—149	+1	4 19 0
65,780	,,	,,	5½	Do. B	115—117	..	5 0 5
65,500	,,	Dec. 30	4	Do. 4 p.c. Deb.	96—98	..	4 1 8

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
4,940,000	Stk.	May 12	9	Imperial Continental	186—188*	−½	4 15 9
1,235,000	Stk.	Feb. 10	3½	Do. 3½ p.c. Deb. Red.	92—94	..	3 14 6
200,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	119—121	..	4 19 2
561,000	Stk.	Feb. 24	10	Liverpool United A.	214—216	..	4 12 7
718,100	,,	,,	7	Do. B.	163—165	..	4 4 10
306,083	,,	Dec. 30	4	Do. Deb. Stk.	102½—104½	..	3 16 7
75,000	5	Dec. 15	6	Malta & Mediterranean	4⅜—5	..	6 0 0
560,000	100	Apl. 1	5	Met. of) 5 p.c. Deb.	100—102	..	4 18 0
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 11	3⅝	Monte Video, Ltd.	13—13½	..	5 3 8
1,775,892	Stk.	Feb. 24	4⅜	Newc'tle&G'tesh'd Con.	102—103	+½	4 5 0
529,705	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	89—90	..	3 17 9
55,940	10	Mar. 10	7	North Middlesex 7 p.c.	14½—15½	..	4 10 4
300,000	Stk.	Apl. 27	8	Oriental, Ltd.	136—138	..	5 15 11
60,000	5	Apl. 12	8	Ottoman, Ltd.	6⅞—7⅛	..	5 10 4
31,800	53	Feb. 24	13	Portsea Island A	135—140	..	4 18 4
60,000	50	,,	13	Do. B	—	..	—
100,000	50	,,	13	Do. C	120—125	..	4 16 0
114,800	50	,,	10	Do. D and E.	—	..	—
398,490	5	Oct. 28	8†	Primitiva Ord.	7⅞—8⅛	..	4 18 6
796,980	5	Dec. 30	5	Do. 5 p.c. Pref.	5⅛—5⅜	+1/16	4 9 11
488,900	100	Dec. 1	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
312,650	Stk.	Dec. 30	4	River Plate 4 p.c. Deb.	96—98	..	4 1 8
250,000	10	Mar. 24	9	San Paulo, Ltd.	16⅛—16⅜	+½	5 7 6
115,000	10	,,	6	Do. 6 p.c. Pref.	11⅛—12	..	5 0 0
125,000	50	Jan. 3	5	Do. 5 p.c. Deb.	50—51	..	4 18 0
135,000	Stk.	Mar. 24	10	Sheffield A	235—237	..	4 4 5
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,500	,,	,,	10	Do. C	234—236	..	4 4 9
70,000	10	Oct. 14	6	South African	9—10	..	6 0 0
6,429,895	Stk.	Feb. 10	5/9/4	South Met., 4 p.c. Ord.	119—121	..	4 10 3
1,895,445	,,	Jan. 13	3	Do. 3 p.c. Deb.	79½—81½	..	3 13 7
209,820	Stk.	Mar. 10	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Feb. 24	5⅜	S'th Suburb'n Ord. 5 p.c.	119—121	..	4 13 6
60,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
117,058	,,	Jan. 13	5	Do. 5 p.c. Deb. Stk.	123—125	+1	4 0 0
502,310	Stk.	May 12	5	Southampton Ord.	109—111*	+½	4 6 11
120,000	Stk.	Feb. 10	7	Tottenham) A 5 p.c.	147—150	+6½	4 13 4
483,940	,,	,,	5½	and) B 3½ p.c.	115—117	..	4 14 0
149,470	,,	Dec. 15	4	Edmonton) 4 p.c. Deb.	98—100	..	4 0 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	9—9⅜	..	8 8 6
149,900	10	Jan. 3	5	Do. 5 p.c. Deb. Red.	98—100	..	5 0 0
236,476	Stk.	Feb. 24	5	Tynemouth, 5 p.c. max.	115—117	..	4 5 6
255,636	Stk.	Feb. 24	6¾	Wands-) B 3½ p.c.	141—143	..	4 14 5
85,766	,,	Dec. 30	3	worth) 3 p.c. Deb. Stk.	73—75	..	4 5 6

Prices marked * are "Ex. div." † Next dividend will be at this rate.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

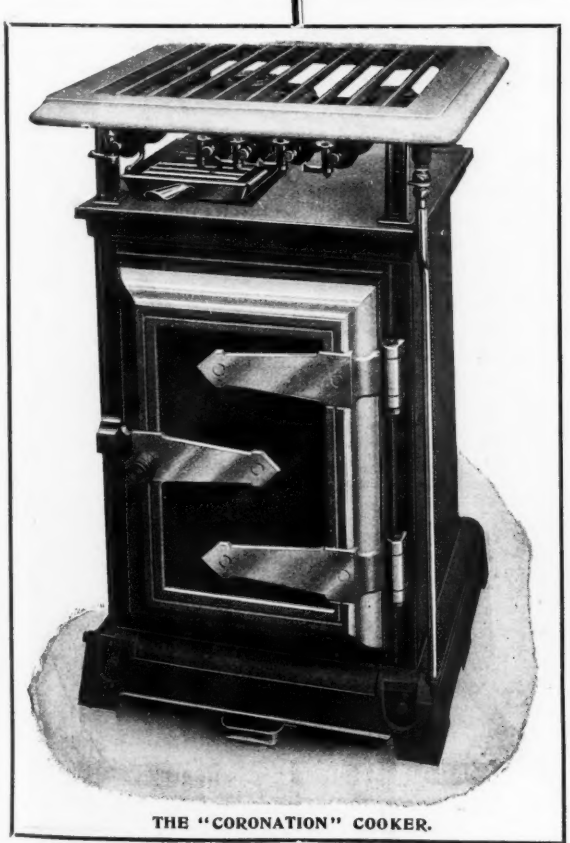
At a meeting of the Edinburgh and Leith Gas Commissioners on Monday last, the minutes of the meeting of the Commissioners held on April 17 were submitted. In these it was stated that the coal tenders which were then accepted amounted in all to 172,000 tons. When the minutes were submitted for approval, Bailie Pennell, of Leith, called attention to the fact that there was stated in them a resolution by the Works Committee that they would recommend the lowest tender for each article except one in the schedule of general stores; and he asserted that this resolution had not been adhered to. He declared that if this were allowed to pass it would be a scandal, and that the effect of it would be to prevent *bonâ fide* offerers sending in tenders. It was intimated that all the agreed-on tenders had been accepted. The subject, after discussion, was sent back to the Works Committee for inquiry. Mr. T. Bryson reported that a small Committee had been appointed to bring up a report as to the retention of the chimney at the old gas-works in New Street. There is great objection to the chimney being where it is, because it is a blot on the landscape, and the Commissioners find they are being offered very little for it; so they are prepared to listen to the proposition that it should be cleared away.

It perhaps should have been stated last week that, at the meeting of the shareholders of the Kirkcaldy Gaslight Company, Limited, there referred to, the meeting was presided over by Mr. A. Macpherson, the Chairman of the Company, and that in the course of a brief statement with reference to the arbitration proceedings, he expressed the opinion that, as between man and man, a fair price had been obtained.

The Kirkcaldy Town Council—the Right Hon. R. C. Munro Ferguson, M.P., the Provost, presiding—had the subject of the award before them on Monday last. Bailie Wright, who has been from first to last Convener of the Committee who have negotiated the transfer, made a few observations as to the long inquiry in connection with the arbitration. He was very glad to say that the Oversman had adhered to his former decision, fixing the price at £137,150. It was possibly a pity that the award was worded in the way it was, because it left them with a misconception regarding the actual price they had to pay for the undertaking. They would remember that in 1908, when they first took up this question, they asked Mr. Cockburn Millar to give them a report on the financial position of the Gas Company, and that after they got his report they came to the conclusion that it would be well for them to purchase the undertaking. In this report, which was the main instrument in confirming the Council to go in for the scheme, the figures given showed that during the previous five years the Company's profits amounted to £4548 a year, and that this profit would enable the Company to pay 4½ per cent. on a capital of £100,000, assuming that this was the price they were to pay for the undertaking. But they found that the Company's annual profit was now £6500. They ought to think themselves fortunate in having got the undertaking at the figure secured by the town, because they would observe that the proportion of £4548 of profit to £100,000 and of £6500 of profit to £137,000 was in their favour. The sum of £137,000 was misleading, because there was a very large amount of house property, entirely outside the gas undertaking, and there were loose assets, which came to a very considerable sum. Deducting these, he considered it would be fair to say that the price the town were paying for the undertaking itself worked out at about £117,000. Another thing which gave him a great deal of satisfaction was the price per million cubic feet of gas sold. In Falkirk, the Gas Company's claim was £115,381, which was at the rate of £2192 per million cubic feet; the sale of gas being 52·639 millions. The award was £77,000, which worked out at £1484 per million cubic feet. In Dunfermline, the Gas Company's claim was £132,110, with bond added amounting to £11,900—together, £143,910—making £2459 per million cubic feet. The award was £80,000, *plus* the amount of the bond—together £91,910—making £1570 per million cubic feet sold. In Largs, the price worked out at £3166 per million cubic feet. The Kirkcaldy Company's claim was £200,243, and with house property, loose assets, &c., added, £223,610, which worked out at £1603 per million cubic feet sold. The award was £117,150, which was equal to £940 per million. The sale of gas in Kirkcaldy was 124 million cubic feet. From these figures, it did seem that they ought to be satisfied; and he was sure that the Committee and the Council must consider themselves very fortunate in getting off with such an award. He was very sanguine that they would be able to come out most satisfactorily. In the third year, they would have to pay sinking fund and interest, which would amount to about £9000. At the present moment, the maintainable profits were £6500. He had not the slightest doubt that, with good management and the extension of their business, they would be able in the third year to raise revenue sufficient to pay their way. He was sure they would be able next year to show a profit of £8000, and within the next two or three years not only work the undertaking without raising the price, but be able to do something in the way of lowering it.

The Dunfermline Town Council on Monday approved of the action of the Gas Committee in completing the agreement with the Culross Town Council for the supply of gas to Culross. The agreement which had been prepared in Dunfermline was submitted on Thursday to the Culross Town Council, who unanimously approved generally of it, and remitted to a Committee to negotiate with the Gas Committee of the Dunfermline Town Council as to details.

At the Brechin Town Council on Wednesday, a report was submitted by Treasurer Archibald on behalf of a Special Committee which had been appointed to consider the advisability of the Council acquiring the undertaking of the Brechin Gas Company, Limited. The Committee recommended that the Gas Company be approached as to their willingness to sell, and as to the price they would ask. The net profit of the Company, without deduction of preference dividends and depreciation, it was stated, had increased from £1733 in 1907 to £2002 in 1910. Without expert advice and more precise information about the



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"Main" Cookers represent the small premium for which Gas Undertakings can insure keeping the consumption of gas up to the average during the Summer months. The name "Main" on a Cooker insures efficiency, economy, and satisfaction to the user.

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works and mains, it was impossible for the Committee to put a valuation on the works. They recommended that they be continued, with power to approach the Company and obtain expert advice, at a cost not exceeding £10. This course was agreed to unanimously.

At the opening ceremony of an exhibition of gas appliances which has been held this week in the Lesser City Hall, Perth, under the auspices of the Corporation Gas Department, Councillor Clark, the Convener of the Gas Committee, stated that in 1903 they had 3445 gas appliances in use in Perth, and that at the end of last year the number had increased to 10,978.

CURRENT SALES OF GAS PRODUCTS.

[For Table of "Tar Products Prices," see p. 480.]

LIVERPOOL, *May* 13.

Sulphate of Ammonia.

During the past week the debility of the market has increased still more, owing to the fact of second-hand sellers being more eager to dispose of parcels they had bought previously. Manufacturers have, consequently, only been able to find an outlet for the lots they have offered for sale at a further reduction in prices, and the closing quotations are £13 3s. 9d. to £13 6s. 3d. per ton f.o.b. Hull, £13 5s. to £13 7s. 6d. per ton f.o.b. Liverpool, and £13 8s. 9d. to £13 10s. per ton f.o.b. Leith. In the forward position, there has been some inquiry for shipment Autumn this year and Spring next year; but the prices asked by makers have proved prohibitive, and no first-hand transactions have been reported.

Nitrate of Soda.

There is a fair demand for this commodity, and holders continue very firm at 9s. 9d. per cwt. for ordinary quality and 10s. for refined, on spot.

LONDON, *May* 15.

Tar Products.

The markets for tar products have remained fairly firm during the past week. There has been a fair amount of inquiry for pitch both for near and forward delivery; but there is a wide margin of difference in the ideas of buyers and sellers, so that substantial business is impossible at the moment. In benzols, there is a fair demand, but prices remain about the same. Solvent naphtha is steady, and prices do not improve. Heavy naphtha is in fair demand, and prices are firm at the moment. There is a little more inquiry for crude carbolic. In one or two quarters improved prices are reported to have been paid, although Continental consumers report that they are offered fair quantities at a low price. Creosote is steady, and the market shows some signs of an improvement.

The average values during the week were: Tar, 17s. 9d. to 21s. 9d., *ex* works. Pitch, London, 36s. to 36s. 6d.; east coast, 35s. 6d. to 36s.; west coast, Manchester, 35s. 6d. to 36s., Liverpool, 36s. to 36s. 6d., Clyde, 36s. to 36s. 6d. Benzol, 90 per cent., casks included, London, 8¾d. to 9¼d.; North, 8¼d. to 9d.; 50-90 per cent., casks included, London, 8¼d. to 9¼d.; North, 8½d. to 9d. Toluol, casks included, London, 9¾d.; North, 9¼d. to 9½d. Crude naphtha, in bulk, London, 4d. to 4½d.; North, 3¾d. to 3½d.; solvent naphtha, casks included, London, 11½d. to 1s.; North, 10½d. to 11d.; heavy naphtha, casks included, London, 1s. to 1s. 0½d.; North, 10½d. to 11d. Creosote, in bulk, London, 2¼d. to 2⅜d.; North, 1⅞d. to 2d. Heavy oils, in bulk, 2⅜d. to 2¾d. Carbolic acid, 60 per cent., casks included, east coast, 1s. 7d. to 1s. 8d.; west coast, 1s. 6½d. to 1s. 7½d. Naphthalene, £4 10s. to £8 10s.; salts, 40s. to 42s. 6d., bags included. Anthracene, "A" quality, 1½d. to 1⅝d. per unit, packages included and delivered.

Sulphate of Ammonia.

At the beginning of the week, the market weakened to the extent of about 2s. 6d. per ton at all ports; but towards the close there was a little more inquiry, and prices are again steady. Actual Beckton is quoted £13. Outside London makes are £12 17s. 6d.; Hull, £13 10s. to £13 11s. 3d.; Liverpool, £13 10s. to £13 11s. 3d.; Leith, £13 12s. 6d. to £13 15s.; and Middlesbrough, £13 10s.

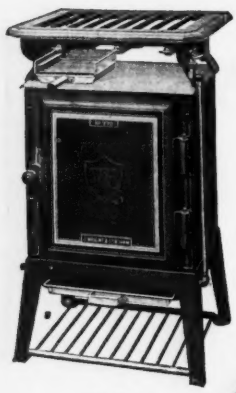
COAL TRADE REPORTS.

Northern Coal Trade.

There is quite an active trade being done in the North, more especially in gas coals. In the steam coal trade, the exports are fair, and to the Baltic they are full. Best Northumbrian steams are from 10s. 7½d. to 10s. 9d. per ton f.o.b. Second-class steams are from 9s. 3d. to 9s. 6d., and steam smalls from 5s. to 6s. 3d. There is a full output of coal from the pits; and it seems to be well taken up. In the gas coal trade, there have been shipments much above what is usual at this season — possibly because the sea freight on the coal is now less than the high rates that were quoted a few weeks ago. Durham gas coals are firm in price. The usual classes vary in price from 9s. 3d. to 9s. 10d. per ton f.o.b., according to quality; and for "Wear specials," from 10s. 6d. to 10s. 10½d. is now the general quotation. For cargoes for Italy there is some demand; and for such, the price at Genoa is said to be from 15s. to 16s. 6d., according to the quality. A home contract is also believed to have been closed for one of the southern towns for some 25,000 tons of second-class gas coals at about 9s. per ton f.o.b. delivered over about a year. As to coke, the market is quiet. Gas coke is less plentiful, and is quoted at about 13s. 3d. to 14s. per ton f.o.b. in the Tyne or Wear.

Scotch Coal Trade.

The market is not very brisk. There is, however, some improvement in the demand for coal for shipment. Small kinds are not in



No. 570.

WRIGHT'S NEW "COMPACT" GAS COOKER.

A NEW Cooker introduced this season to meet the need for a stove which embodies all the advantages and improvements of larger Cookers, and yet is of a size which admits of its being installed in the smallest of kitchens. The "COMPACT" is up-to-date, and highly finished in every detail.

The ovens are constructed on the well-known "EUREKA" pattern, being lined throughout with Porcelain Enamelled sheet steel plates and packed with non-conducting material. An important feature of this cooker is that it is raised about 7in. from the floor by a cast-iron stand, and so any dust or grease may be readily removed from beneath the cooker. A removable floor-rack is provided.

The "COMPACT" is made in two sizes, as illustrated, with single oven, and with double oven, the two ovens being separately controlled. Both Cookers may be had with Plate Racks, or Plate Rack and Hood, if desired.

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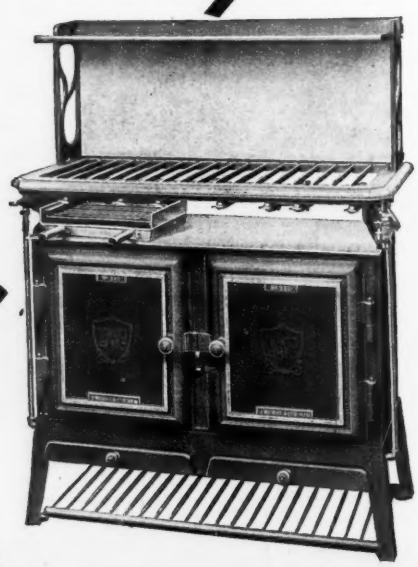
275.



No. 580.

request. Steam coal is moving off readily. The prices now quoted are: Ell, 8s. 9d. to 9s. 9d. per ton f.o.b. Glasgow; splint, 9s. 6d. to 9s. 9d.; and steam, 9s. to 9s. 3d. The shipments for the week amounted to 351,753 tons—an increase of 13,758 tons upon the previous week, and of 29,664 tons upon the corresponding week last year. For the year to date, the total shipments have been 3,289,618 tons—a decrease upon the corresponding period of 67,146 tons.

Electricians Doing Badly.

The following appeared in one of the London evening papers last Friday: In the judgment summons list at Clerkenwell, several debtors were described as electrical engineers. His Honour: The number of people who are in the electrical engineering line seems to be without end; but from one's experience here many of them appear to be doing very badly. Later in the list, a plaintiff's solicitor opened with the remark: "The debtor in this case is also an electrical engineer, your Honour." His Honour: They seem to be as thick as blackberries in autumn. As the list proceeded, there were two further cases in which the debtors were described as electricians. The Judge: Dear me! It seems that electricians are getting into a light that must be very distasteful to them.

Sidmouth District Council and the Gas-Works.

At a meeting of the Sidmouth Urban Council last Wednesday, Mr. C. S. Budd moved: "That this Council desire, in accordance with the provisions of the Lands Clauses Acts with respect to the purchase and taking of lands otherwise than by agreement, to purchase the property and rights of the Sidmouth Gas Company, or, in the event of the Bill now before Parliament being passed, the property and rights of the Sidmouth Gas and Electricity Company, in order that they may carry on the undertaking in the interests of the consumers and of the general ratepayers of the district; that steps be taken in due course to obtain the sanction of the ratepayers to the proposal." He said the object of the resolution was to strengthen the case of the Council, should it be found necessary to appear before a Committee of the House of Commons to ask for a purchase clause in addition to the suspensory clause they already had. In regard to the second part of the resolution, he did not know whether the Council would take steps, or whether it would be left to the Gas Company to call a meeting of the ratepayers. Personally, he should like to see this done as early as possible. Whether the ratepayers sanctioned the purchase of the undertaking or declined to do so, the Council might fairly say that their action in opposing the Bill, and the expenses thereby incurred, had been amply justified by the result so far obtained. Mr. Halse, in seconding the motion, said it would be the best thing for the town, and would probably be an amicable way of dealing with the whole matter. It was absolutely imperative that such undertakings as the one in question should be in the hands of the ratepayers, and not in those of a private company. The motion was carried unanimously.

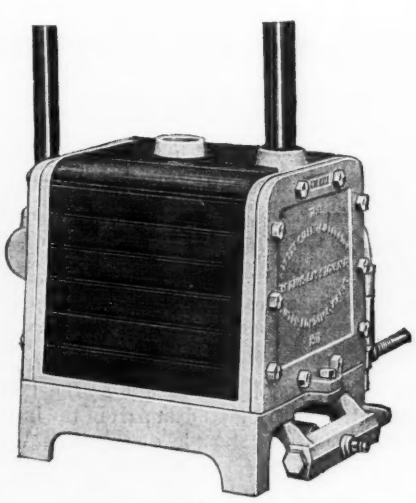
Chemical Engineering and Industries Exhibition.

The first International Chemical Engineering and Industries' Exhibition was opened last Saturday afternoon, at the Royal Agricultural Hall, Islington, by Lord Denbigh. There was a large attendance, including Professor R. Meldola, the President of the Exhibition; Mr. Alexander Siemens, Sir Edward Thorpe, Sir Boverton Redwood, Dr. George T. Beilby, and Sir Gerard Muntz. The exhibition illustrates chemical industry in many branches, including the conversion of the products of the destructive distillation of coal tar into finished coal-tar colours. Lord Denbigh, in declaring the exhibition open, congratulated the Committee on the success of their first venture. On the motion of Professor Meldola, a vote of thanks was accorded to Lord Denbigh. The exhibition will remain open till the 27th inst. One of the exhibits is mentioned elsewhere in the "JOURNAL" to-day; and opportunity will be taken for noticing some few of the others in subsequent issues.

Use of Domestic Water for Trade Purposes.

At the Portsmouth Police Court last Friday, Mr. H. G. Vereker, the occupier of the motor garage at Castle Mews, Southsea, was summoned by the Portsmouth Water Company for using for his trade as a carriage proprietor water which had been supplied by them for use for domestic purposes, contrary to section 61 of the Borough of Portsmouth Water-Works Act, 1857. Dr. S. H. Emanuel, who appeared for the Company, said the defendant had had an agreement with the Company for the supply of water for domestic use; but they terminated it, and stipulated that he should enter into a fresh agreement for a supply by meter for trade purposes, for which they had the power to charge up to 2s. per 1000 gallons. It would be proved that the defendant used water for washing carriages, &c., and therefore for the purposes of his trade, without having an agreement to so use the water. On Dec. 15, 1909, he had notice terminating his agreement; and on the 22nd of March last a letter was sent to him pointing out that the notice expired on the 25th, and that he had taken no steps to enter into a fresh agreement for the supply of water by meter. Evidence having been given by the Engineer (Mr. H. Ashley) and the Secretary (Mr. J. L. Wilkinson), Mr. Hagon, who appeared for the defendant, admitted that the water had been used for trade purposes. The only point he had to raise was whether the Company had any authority for insisting on the supply of water by meter. He submitted that under the Water-Works Clauses Act, 1863, and also under the Public Health Act, 1875, special powers had to be obtained for authority to supply water by meter. His client had been perfectly willing to enter into an agreement; but he discovered that the Company had no power to charge by meter. The Bench decided against Mr. Hagon on the point raised; and they imposed a fine of £2, with costs—amounting altogether, however, to only 8s. 6d.

What is Essential



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LUTON.

An Exciting Fire at Leeds.

There were some exciting scenes in connection with a fire which broke out at a Leeds clothiers' shop last Sunday week. With the dense smoke issuing from the burning clothing there was mingled a quantity of escaping gas (caused by the melting of the pipes), and a number of men engaged in battling with the outbreak were overcome. Altogether, five of them were removed to the infirmary; but only three were detained through the night, and it was not anticipated that they would be kept long in the infirmary, as their condition did not give rise to any anxiety. It is stated that two photographers were on the premises at the time of the fire, photographing the interior, where extensive alterations had just been made. The photographs were being taken by means of an arc lamp. In reporting the occurrence, the "Yorkshire Post" remarked that "the origin of the outbreak is something of a mystery, and will probably never be satisfactorily elucidated. One theory is that it may have been caused by the fusing of an electric coil." From inquiries since made, it seems that there is no doubt on the part of either the fire authorities or the shop manager that the fire was due to the fusing of an electric wire. The escape of gas referred to was caused by the melting of the lead inlet to one of the meters in the basement of the premises. The flames from this pipe mingled with those from the burning wooden racks and stock; and, in the excitement of the moment, their source was not noticed. The service pipe entered the premises by the side of a small dark-glass window giving light to the basement. On the fire being discovered, this window was smashed; and a powerful water jet was inserted to play upon the flames within. There can be little doubt that the impact of the jet extinguished the flame issuing from the open end of the service; and, acting as an injector, it carried forward the issuing gas through the basement. There is a staircase a little to the window side of the centre of the basement, up which the gas passed, and was carried by the keen draught through the shop and out by the shop door. It seems little short of miraculous that an explosion of the gas and mingled air did not occur; but this may well be attributed to the velocity of the draught caused partly by the fire in the basement below (to which the staircase acted as a large chimney) and partly by the injector action of the firemen's jets playing into the basement through the small windows. It was in trying to get into the basement by way of the staircase that the firemen were gassed. Most likely the gassing was accelerated by the large quantities of smoke passing up the staircase at the same time. Of course, as soon as the water jet ceased playing through the small window first spoken of, the gas issuing from the service passed mainly out through this window, and thus the action originally going on was largely reversed. Of course, this explanation is largely conjectural, but no other theory appears to fit all the facts of the case so well.

For machinery, buildings, and plant at the Knighton Water-Works, the tender of Mr. W. Matthews, for £7970, has been accepted by the Ryde Town Council, subject to the approval of the Local Government Board for obtaining the necessary loan.

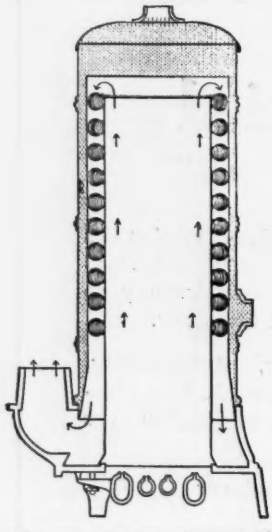
Reductions in the Price of Gas.

The Brighouse Corporation have decided to reduce the price of gas within the borough by 3d. per 1000 cubic feet—from 2s. 7d. to 2s. 4d. net—with the same reduction on the graduated scale of the large consumers, and also to Clifton, which is supplied by Brighouse. At the meeting of the Walsall Town Council on Monday last week, on the recommendation of the Gas Committee, it was decided to reduce the prices charged for gas to the different classes of consumers as follows: For power purposes, from 1s. 10d. to 1s. 8d. per 1000 cubic feet; for lighting, from 2s. 6d. to 2s. 5d.; and through prepayment meters, at a discount of an additional 5 per cent. The concessions represent upwards of £2000 on the present consumption of gas. On the occasion of the opening of the new show-rooms of the Hampton Court Gas Company last Wednesday, noticed elsewhere, the Chairman (Mr. A. Goodman) announced that from the June quarter-day the price of gas would be reduced 2d. per 1000 cubic feet to ordinary consumers, with an equivalent allowance to those on the prepayment system.

Large Sale of Stocks and Shares.

At the Mart, Tokenhouse Yard, E.C., last Tuesday, Messrs. A. & W. Richards placed two new issues of gas and water capital by order of Directors, and disposed of various stocks and shares, which yielded a total of £32,303. The first lots comprised a new issue of £5000 of 5 per cent. preference stock and a like nominal amount of additional ordinary stock of the Southgate and District Gas Company. The former was all sold at £113 to £115, and the latter at £144 to £147, per £100. The other new issue was by the Southend Water Company; and it consisted of 1500 new ordinary £10 shares, ranking for a maximum dividend of 5 per cent. per annum, the existing similar shares carrying 4½ per cent. The whole of the issue was sold at par. A few £10 "A" shares in the Tendring Hundred Water Company, ranking for a maximum dividend of 8 per cent., but carrying 4½ per cent., fetched £11 10s. each. A small parcel of 5 per cent. stock of the Maidstone Gas Company, carrying £7 5s. 6d. per cent. dividend, was sold at £149 per £100. The final lots consisted of some £10 shares (three classes) in the East Grinstead Gas and Water Company, offered for sale by order of Trustees. The "A" shares, ranking for a maximum dividend of 10 per cent., but carrying £9 10s. per cent., fetched £19 10s. each; the "B" shares (7 per cent. maximum, but carrying £6 13s. per cent.), £13 10s.; and the "C" shares (similar dividends), £12 15s. to £13.

Fire at the Droitwich Gas-Works.—During the preparation, at the Droitwich Gas-Works last Thursday, of a quantity of tar for asphalting purposes, it boiled over, and burst into flame. Dense clouds of smoke rose into the air; and the neighbourhood of the works was soon filled by an excited crowd. The flame was within 10 or 12 yards of the largest gasholder. Two "extincteurs" were promptly brought into use; and the fire was soon put out.



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See next Advertisement May 30th, for Description of Parts.

ITS ECONOMY.

NOTE THE ARROWS. They indicate the course of the heated products showing

(1) That the heat first strikes the top plate, heating the water in the upper part of the Circulator and inducing rapid circulation.

(2) That the products next ***descend*** passing through special heat conductors which increase the surface of the water chamber by 100%.

(3) That they finally escape at the bottom after contact with the coldest part of the interior —the recognised principle of scientific Water Heating.

The result is Gas Economy, not only on account of the almost complete absorption of the heat by the conductors, but because the heat cannot escape at the top and becomes stored and accumulated in the interior cavity.

THE PARKINSON STOVE CO., LTD.

(Incorporating Maughan's Patent Geyser Co.),

BIRMINGHAM AND LONDON.

Projected Amalgamation of the Leatherhead and Cobham Gas Companies.—A short time ago, an offer was made to the Cobham Gas Company for the acquisition of their undertaking by the Leatherhead Gas Company; and the offer has been accepted. In order to strengthen the hands of the shareholders of the former concern in making the necessary application for parliamentary powers to carry into effect the proposed scheme for amalgamation, a petition in favour of the proposal has been signed by most of the leading residents of Cobham who are consumers of gas. A similar petition is being signed by the residents of Oxshott. The support thus accorded to the scheme by the consumers will, it is hoped, enable parliamentary powers to be obtained much sooner than would otherwise be the case.

Beverley Water Supply.—The Gas and Water Committee have reported to the Beverley Town Council that the Town Clerk has written to the Local Government Board, in reply to a communication, informing the Board that, as they had refused their consent to any part of the loan already sanctioned for a new well being applied in defraying the cost of filtration works at the existing source, the responsibility for the consequences of any contamination must rest with them. The Local Government Board replied that they could not accept any responsibility in the matter, and added that they were awaiting the further proposals of the Town Council for obtaining a satisfactory source of water supply. Mr. Wray asked what the present position was, and whether they contemplated taking any further steps to obtain a fresh source of supply. If they were to remain as they were, he thought it would be unsatisfactory. Alderman Nutchey stated that the matter was left in the hands of a Sub-Committee, who were having plans prepared for the filtration by mechanical means of the present water. Mr. Turner said they had taken every precaution to preserve the purity of the present supply; and with the addition of filtration, he should be satisfied. After further discussion, the minutes were approved.

Wrexham Gas Company's "Gas Supply" Class.—The students in the "Gas Supply" class of the Wrexham Gas Company who sat for the examination recently held by the City and Guilds of London Institute were entertained at tea by Mr. J. Braithwaite, the Engineer and Manager of the Company, last Tuesday evening. Unfortunately he was not able to attend, as he is only just recovering from a severe illness; and in his absence Mr. Owen Evans presided. In proposing a hearty vote of thanks to Mr. Braithwaite for the kind thoughtfulness which had prompted the invitation, the Chairman said this was the third time Mr. Braithwaite had entertained the class, in which he takes so great an interest. Mr. Evans also called attention to the exceptional opportunities afforded by the Directors of the Company to their employees for the furtherance of their technical knowledge. Mr. Crease seconded the proposition, and referred to the benefits derived by attendance at the class, and also to the co-partnership scheme of the Company, which also had been inaugurated at the instance of Mr. Braithwaite. The vote of thanks was carried by hearty acclamation. Mr. Gretton Hughes proposed the health of Mr. Braithwaite, and coupled with it the name of the class teacher, to which Mr. Evans replied.

Tiverton Gas Undertaking.—At the meeting of the Tiverton Town Council on Monday last week, Mr. John Thorne, the Chairman of the Lighting Committee, reported that the sales of gas for the past financial year produced £9583, against £8981 the previous twelve months. The expenditure was £6733, compared with £5892. The gross profit in 1910-11 was £3089; in the preceding year, £2850. The standing charges were £2672, against £2540; and the net balance was £178, compared with £548. They would not for some years reap the full benefit of the improvements they were paying for out of revenue and the reserve fund. It was a successful year's working, chiefly due to their efficient Manager (Mr. Clark Jeffery).

Stafford Water Supply.—At the monthly meeting of the Stafford Town Council last Tuesday, the Water Committee submitted their report on the accounts of the department for the year ended the 31st of March last. On the revenue account, there was an increase of £627 in income and a decrease of £2 in expenditure. The sum of £940 having been set aside for depreciation, there was a gross profit of £4402 carried to the profit and loss account. To this was added the balance of £69 brought forward and £175 dividends on investments; making a total of £4646. Out of this sum, there had been paid £3463 for loan redemption, interest, and income-tax, and £900 to the district fund in aid of the rates; and the sum of £200 had been carried to the reserve—leaving a balance of £83.

Chorley Corporation Gas Accounts.—At a meeting of the Chorley Town Council on Monday last week, Alderman H. N. Whittle, in presenting the accounts of the gas undertaking for the past financial year, stated that the coal cost 9d. per ton more than the previous year; but a saving equal to 241 tons had been effected owing to the higher yield of gas per ton. The return from bye-products was £4657, on a total expenditure for coal of £7264. The average price per ton was 10s. 4d.; but as they had received a return of 6s. 6½d. per ton for bye-products, the net actual cost per ton was 3s. 9¾d. There was an increased expenditure on the revenue account of £1080; and the balance available was £2480. It was proposed to put £1219 to a special reserve fund, and to devote £1042 to the relief of the rates.

Colwyn Bay Gas Undertaking.—The results of the working of this undertaking for the year ended the 31st of March must be very satisfactory to the Council, when compared with those of the previous year. The production of gas per ton of coal used was 11,612 cubic feet, against 10,474 cubic feet before—an increase of 1138 cubic feet, though 672 tons less coal were carbonized. The gas produced showed an increase of 400,000 cubic feet, with more than 1,500,000 cubic feet sold. There were also 154 tons of coke, 8000 gallons of tar, and 54,680 gallons of ammoniacal liquor available for sale. The unaccounted-for gas stands at 8·40 per cent., against 14·17 per cent. two years ago. The net profits amounted to £1152 more than in the year 1909-10, after wiping out bad debts amounting to £205, the accumulations of a number of years. A much larger sum was spent on the works out of revenue during the past year, in order to bring them up to modern practice, than will be required in subsequent years.

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LEST YE FORGET.

Petone (N.Z.) Gas-Works.—According to the "Board of Trade Journal," the municipal gas-works at Petone, a suburb of Wellington (N.Z.), which have proved to be successful from a financial point of view, are not large enough to cope with the ever-increasing consumption of gas in the town and the neighbouring borough of Lower Hutt. It is recommended that another gasholder, capable of containing 200,000 cubic feet, should be constructed. It is estimated that an expenditure of from £7000 to £8000 would be required to fully equip the gas-works.

Gas Profits at Bolton.—The Gas Committee of the Bolton Corporation have decided to hand over in relief of the rates £20,000 out of the profits on the working of the gas undertaking during the past financial year, and to carry the balance of £9136 to the credit of the reserve fund account. The Committee have passed a resolution that the Finance Committee be informed that the estimated amount from the Gas Department for the year ended March 31, 1912, available in aid of the rates shall be £20,000, which is 2½ per cent. on the estimated capital of £800,000. The grant is the same as last year.

The New Welsbach Company.—A Company has been registered with a capital of £265,000, in £1 shares, to take over the business of the Welsbach Incandescent Gas-Light Company, Limited, and to adopt agreements (1) with the Deutsche Gasgluhlicht Aktien-Gesellschaft (Auergesellschaft), and (2) with the Welsbach Incandescent Gas-Light Company, Limited, H. E. Spinney, Liquidator of the Company, and the Deutsche Gasgluhlicht Aktien-Gesellschaft (Auergesellschaft). The first Directors (not less than five nor more than seven) are: R. Feuer, L'ce. Fletcher, F. Kallmann, and E. Lovinson.

New Joint-Stock Companies Registered.—The Spelmont Gas and Electric Generator Syndicate, Limited, has been registered with a capital of £5000, in 40,000 preference shares of 2s. each, and 1000 deferred £1 shares. A Company under the title of Samuel Peace and Sons, Limited, has been registered with a capital of £10,000, in £1 shares, to carry on, among other things, the business of manufacturers of gas-retort tools and general contractors to gas and water companies and municipal corporations. The Crowle Gaslight and Coke Company, Limited, has been registered with a capital of £3000, in £10 shares.

Tar-Spraying of Roads in Lancashire and the Cost.—At the Lancashire County Council meeting last Thursday week, Alderman J. Shuttleworth referred to the tar-spraying experiments which had been carried out on county roads, and to the fact that the estimates of the Main Roads and Bridges Committee included an increased amount for this purpose. The Committee, he said, were pleased with the results of the experiment, and desired to extend the tar-spraying. Great gratification had been shown by the residents in those parts of the county where tar-spraying of the roads had been carried out. Alderman Shuttleworth, in reply to a question, said the cost was 1½d. per super yard. Great injury to crops on land adjoining the roads had been saved, he was informed. The estimates were approved.

Ash-next-Sandwich Water Supply.—An application having lately been made to the Local Government Board by the Eastry Rural District Council for authority to borrow £1650 for works of water supply in the parish of Ash, the matter was inquired into a few days ago by Mr. Courtenay T. Clifton, M.Inst.C.E., one of the Board's Inspectors. The Clerk to the Council (Mr. F. S. Cloke) briefly opened the case, and called Dr. Robinson, the Medical Officer of Health, who described the unsatisfactory condition of the existing water supply at Richborough and Westmarsh, and pointed out the desirability of having a supply from the water-works. Mr. Shenton, the Council's Consulting Engineer, explained the proposed scheme in some detail. He said one main was to serve Richborough and another Goldstone, Copp Street, Ware, and Westmarsh. Mr. Lilliott, of Westmarsh, questioned the need for a water supply in the district; but the Vicar and other residents strongly supported the application. Such slight opposition as was expressed, which was mostly on points of detail, was formally withdrawn.

Manchester Corporation Water Undertaking.—The Water Committee of the Manchester Corporation have decided that the charges for water shall be the same for the ensuing year as for last year; and they therefore recommend the Council to levy a domestic water-rate of 9d. in the pound, and a public water-rate of 3d. The annual report of the Water Department shows that during the past twelve months the average daily consumption was 41,679,085 gallons—an increase of 551,576 gallons per day on the preceding period. The total receipts for water were £270,845 from within the city, and £144,941 from outside. The gross receipts were £427,398; and the Committee are able to transfer £70,470 to the sinking fund, and carry forward £17,845 to next year. To this must be added a sum of £1440, the surplus at the end of March, 1910. The estimates for the ensuing year show a deficit of £6149; reducing the present surplus by this amount. The annual report records that at the end of the past year 21¼ miles of pipe had been laid under two contracts towards the construction of the third Thirlmere conduit. Under another contract three miles of pipes had been put down.

Lincoln Water-Works Scheme.—The extensive scheme of water supply which is being carried out by the Lincoln Corporation at Elkesley, near Worksop, is approaching completion. The works were visited last Thursday by some members of the Council and other gentlemen, and were shown over them by the Water Engineer (Mr. Niel M'K. Barron). The water is obtained by means of four boreholes, 3 feet in diameter and 570 feet in depth. The pumping apparatus lifts the water to settling-tanks, and then forces it through 22 miles of 21-inch pipes to Lincoln. One of the engineering difficulties which had to be overcome was that of crossing the River Trent. This has been accomplished by means of a steel bridge, the main span of which is 262 feet; and there are also five other spans of 65 feet each. At the Lincoln end, the water is delivered into an elevated tank 100 feet above the ground, supported on a masonry tower, and capable of holding 300,000 gallons. This tank is for the supply of the high-level district. The water then gravitates from the tank to a service reservoir situated at Bracebridge Heath, three miles from Lincoln. The reservoir is covered, and holds 6 million gallons; and it will be used for the supply of the greater part of Lincoln. It is expected that the water will be delivered early in September.

THREE POINTS

of advantage from the many found in our Slot Meters are:

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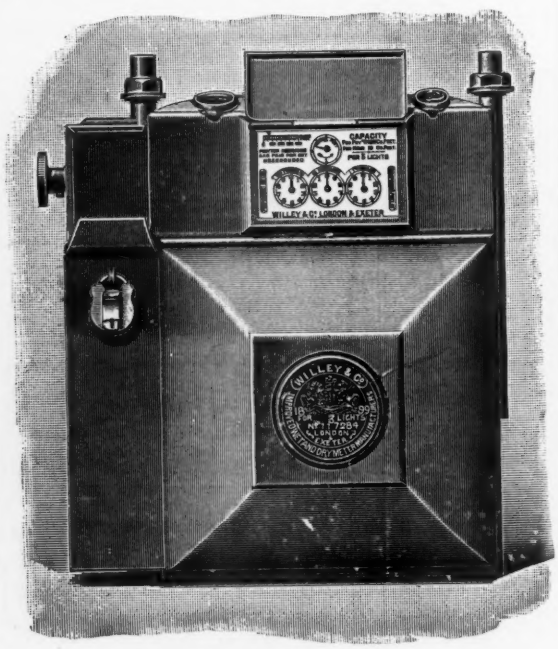

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D. M. NELSON & CO., 53, WATERLOO STREET, GLASGOW.

Messrs. James Milne and Son, Limited, have secured from H.M. Office of Works the contract for gun metal and brass valves.

The report presented at the recent annual meeting of the Selsey (Sussex) Water Company was to the effect that the undertaking is now paying its way. Their receipts from water amounted to £275, compared with £103 the previous year; the result being a profit of £91.

It was stated at a meeting of the Heywood Town Council last Thursday that the profits on the gas undertaking for the past financial year amounted to £1147, out of which the Gas Committee had decided to allocate £450 in relief of the rates. A loss of £2044 was reported on the Electricity Department.

The Argentine Government have just placed an order for 22 additional Venturi water-meters, ranging in size from 10 inches to 54 inches—supplementing in this way the series of between thirty and forty of these meters which are already successfully operating at the different Government water-works.

In the "JOURNAL" for Nov. 22 last year (p. 564), reference was made to the Kerpely Gas-Producer; and it may be of interest to record the fact that the makers (Messrs. E. G. Appleby and Co.) have met with considerable success in the sale of this producer. They have on order at present seventeen producers of the largest size, including a battery of nine for the new works at Scunthorpe (Lincs.) of Messrs. John Lysaght, Limited.

The annual dinner of the Society of Engineers is to be held at the Criterion Restaurant on Saturday, the 27th inst. Mr. F. G. Bloyd, the President, will be in the chair; and the guests will include Mr. Alexander Siemens, the President of the Institution of Civil Engineers, Mr. E. B. Ellington, the President of the Institution of Mechanical Engineers, Professor C. Vernon Boys, F.R.S., and others. After the dinner, there will be a *conversazione* and concert.

In the House of Commons yesterday, Mr. William Thorne asked the Secretary of State for the Home Department if he was aware that it is the practice of the Gaslight and Coke Company to stop 1d. per month from workmen's wages to pay for a copy of the "Co-partners' Magazine;" whether this was a violation of the Truck Act; and, if so, if he intended taking action in the matter." Mr. Churchill said he was informed that the deduction referred to was made in the case of men who are members of the Company's co-partnership arrangement, and who assent to it. The deduction being made, as he understood, for the purpose of making a payment to a third party on the workmen's behalf, no offence would appear to be committed against the Truck Act, having regard to the decision in *Hewlett v. Allen*.

According to the report of Meters Limited, which will be presented at the ordinary general meeting in Manchester next Tuesday, the trading in the year ended the 31st of March resulted in a gross profit of £33,706, which, however, is reduced by general management expenses, directors' fees, depreciation of buildings, machinery, and plant, &c. After providing for interest on the debenture stock, the net profit amounts to £27,071, which, with £2496 brought forward, makes £29,567. Out of this, interim dividends at the rate of 5½ per cent. per annum upon the preference shares and of 4 per cent. per annum upon the ordinary shares were paid in November last; and the Directors now recommend the payment of further dividends at the rate of 5½ per cent. per annum upon the former and of 9 per cent. per annum upon the latter shares—making the ordinary dividend 6½ per cent. for the year. They also recommend that £9000 should be added to the reserve fund, making it £75,000; and that the balance of £3369 should be carried forward.

APPLICATIONS FOR LETTERS PATENT.

10,462.—SHOULS, E., and FLETCHER, H. E., "Gas-turbines." May 1.

10,487.—GREGORY, G. R., "Gas-fired furnaces." May 1.

10,518.—JEFFERY, S. F., "Automatic combined safety gas cock and valve." May 1.

10,529.—WILDE, P. R., "Treating products of combustion." May 1.

10,651.—STANLEY, A. H., "Artificial fuel." [A communication from D. C. Morris.] May 2.

10,659.—GOW, J., and the GAS-METER COMPANY, LTD., "High-pressure gas-meters." May 2.

10,660.—SMITH, F., "Method of working hydraulic mains, and apparatus in connection therewith." May 2.

10,662.—WEBB, G. J., "Cleaning pipes." May 2.

10,674.—LEIGH, A. G., "Automatically producing power." May 3.

10,700.—RIDLEY, A., "Telescopic gas-fittings." May 3.

10,712.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, "Dry gas-meters." May 3.

10,719.—BEST, H., "Packing pipe-joints." May 3.

10,730.—JONES, A. B., "Joints for tubes, tanks, and the like." May 3.

10,769.—LAW, J. A., "Production of incandescent light." [A communication from A. Kitson.] May 3.

10,840.—COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATÉRIEL D'USINES À GAZ, "Gas-meters." May 4.

10,852.—WILSON, G., "Coin-freed devices for regulating the supply of fluids." May 4.

10,863.—GILL, P., "Heating, lighting, and ventilating dwellings." May 5.

10,906.—CARPENTER, C. C., "High-pressure incandescent gas-lamps." May 5.

10,911.—ROYSTON, E. R., "Gas producers or generators." [A communication from A. J. Rickie.] May 5.

10,950.—LEE, G. P. M., and BATTLE, A. E., "Gaslight pendant." May 6.

10,952.—MACDONALD, A. M., "Gas-burner." May 6.

10,959.—RALPH, G. J., and HOLMES, J. H., "Gas-detecting apparatus." May 6.

10,967.—TATE, J. R., & F., "Detecting leakage in pipe-lines." May 6.

10,984.—ADAMS, S. H., "Gas-lamp supports." May 6.

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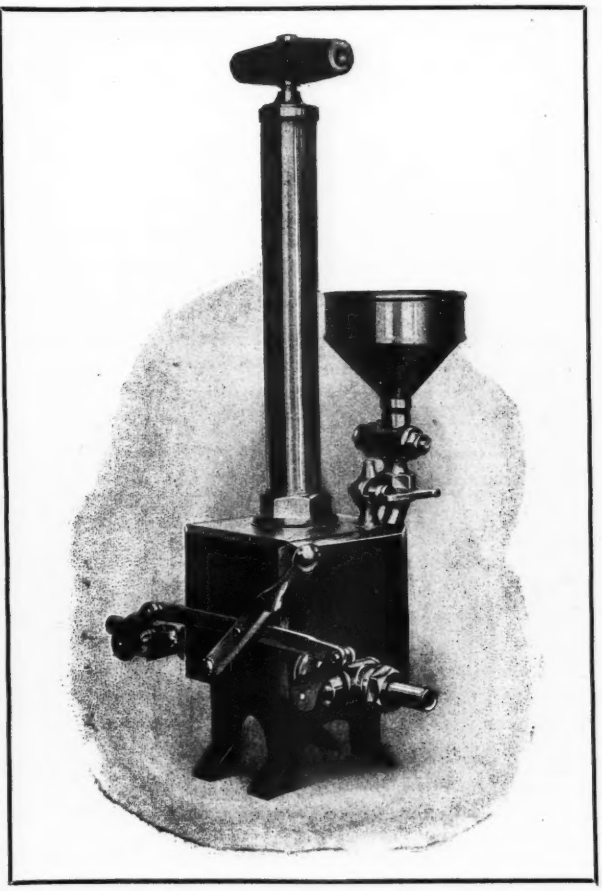

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About a hundred firms of mining engineers are represented at the Mining Exhibition opened in Manchester last Friday by Sir Thomas Holland, Professor of Geology at the Manchester University. An exhibit which attracts a good deal of attention is that from the Department of Mining in the Manchester University. It is an apparatus designed by Mr. George H. Winstanley for giving practical training and instruction to colliery firemen in testing for gas. It is stipulated under the new Mines Bill that colliery firemen and deputies will be required to obtain certificates of their ability to make accurate tests for inflammable gas; and Mr. Winstanley's apparatus is to enable the firemen to acquire the necessary degree of skill. By its use "caps" over the flame in the lamp, indicating the presence of inflammable gas in varying quantities, can be produced and observed for any period the experimenter desires; the lamp meanwhile being left free to be handled in the usual way. At this stand there is a dark room in which demonstrations of testing for gas are given. Three firms exhibit coal-cutting machines, driven by electrically compressed air. The exhibition has been organized by the "Engineering Review."

TAR PRODUCTS PRICES.

Representative manufacturers give the following as fair current values for the week ending May 13. Prices are net, and they include the usual packages and delivery f.o.b., f.a.s., or f.o.r., as customary.

Article.	Basis.	London.	North-East Coast.	East Coast, Yorks.	West Coast.		Glasgow.
					Liverpool.	Manchester.	
Tar crude	per ton	—	18/6 21/6	18/6 22/-	19/- 21/3	19/- 21/3	—
Pitch	,,	37/-	36/-	36/-	37/-	36/3	36/-
Benzol, 90%	per gallon	-/10¼	-/9	-/9	-/9	-/8⅞	-/9¼
Benzol, 50-90%	,,	—	-/9¼ -/9½	-/9½	-/8⅜	-/8⅜	—
Toluol, 90%	,,	—	-/9¼ -/10	-/10	-/10	-/10	-/10
Crude naphtha, 30%	,,	—	-/3⅜	-/4	-/3½ -/3⅝	-/3⅝	—
Light oil, 50%	,,	—	-/3⅜	-/3⅜ -/4	-/3⅜ -/3½	-/3½	—
Solvent naphtha, 90-160	,,	—	-/10¼	-/10	-/10	-/10¼	-/11
Heavy naphtha, 90-190	,,	—	-/11	-/11½	-/10⅞ -/10¾	-/11	-/11
Creosote in bulk	,,	-/2½	-/2⅛	-/2	-/2 1/16	-/2 1/16	-/1⅞
Heavy oils	,,	—	-/2⅝ -/2¾	-/2¼	-/2⅛	-/2⅛	-/2¾
Carbolic Acid, 60's	,,	—	1/7¼	1/8	1/7	1/7	1/8
Naphthalene, crude drained salts	per ton	—	42/6 45/-	40/- 42/6	46/3	47/6	—
,, pressed	,,	—	60/-	63/-	58/9	58/9 72/6	—
,, whizzed	,,	—	—	—	62/6 72/6	62/6 72/6	63/-
Anthracene	per unit	-/2	-/1¼	-/1½	-/1½	-/1½	—

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

SECRETARY AND GAS MANAGER. Farnham Gas and Electricity Company.
GAS ENGINEER AND MANAGER. Buxton Urban District Council. Applications by May 31.
FOREMAN GAS-STOVE FITTER. No. 5397.
SHOW-ROOM MANAGER. No. 5401.
DISTRICT INSPECTOR. No. 5405.
WORKS FOREMAN. No. 5403.
SHOW-ROOM ATTENDANT. Shanghai Gas Company. Applications to H. King Hiller, 9, Victoria Street, S.W.

Situations, &c., Wanted.

MANAGERSHIP (WITH INVESTMENT). No. 5402.
REPRESENTATIVE OR AGENT (France). G. Margueritte, Paris.
REPRESENTATIVE (CHEMICAL). No. 5405.
SULPHATE PLANT REPAIRER, &c. Davies, Shepherd's Bush.

Plant, &c. (Second-Hand), Wanted.

PURIFIERS, &c. Evetts, Westminster.

Plant, &c. (Second-Hand), For Sale.

BRIDGE PIPES, ASCENSION PIPES, MOUTHPIECES, &c. John Adams and Sons, Newcastle-on-Tyne.
MOUTHPIECES, ASCENSION PIPES, &c. Chertsey Gas-Works.

Stocks and Shares.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY. By Auction. May 30.
BISHOP'S STORTFORD, &c., GAS AND ELECTRICITY COMPANY. By Auction at Epping. May 26.
DORKING GAS COMPANY. By Auction. May 30.
EAST KENT WATER COMPANY. By Auction. May 23.
SOUTH KENT WATER COMPANY. By Auction. May 30.
WANDSWORTH AND PUTNEY GAS COMPANY. By Auction. May 23.
WEST KENT GAS COMPANY. By Auction. May 23.
YORKTOWN AND BLACKWATER GAS COMPANY. By Auction. May 23.

TENDERS FOR

Coal and Cannel.

BUXTON GAS DEPARTMENT. Tenders by May 27.
CLACTON URBAN DISTRICT COUNCIL. Tenders by May 22.
CLITHEROE GAS DEPARTMENT. Tenders by May 25.
GLOUCESTER GASLIGHT COMPANY. Tenders by May 29.
HEREFORD GAS DEPARTMENT. Tenders by May 20.
SKIPTON URBAN DISTRICT COUNCIL. Tenders by May 27.
SMETHWICK GAS DEPARTMENT. Tenders by May 24.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 29.
WREXHAM GAS COMPANY. Tenders by June 1.

Coke Screening Plant, &c.

MANCHESTER GAS DEPARTMENT. Tenders by May 27.

Fire-Clay Goods (and Resetting Retorts).

CLACTON GAS AND WATER DEPARTMENT. Tenders by May 25.

Gas-Works Concessions and Extensions.

ODESSA CORPORATION. Tenders by June 10, 23.

General Stores (Lime, Oilman's Goods, Ironmongery, Oils, Waste, Electrical Fittings, Bitumen, Bricks, Ballast, Cement, Stopcock Covers, &c., &c.).

CLACTON URBAN DISTRICT COUNCIL. Tenders by May 22.
LOUGHBOROUGH GAS DEPARTMENT.
SWADLINCOTE GAS DEPARTMENT. Tenders by May 29.

Mantles.

CLACTON URBAN DISTRICT COUNCIL. Tenders by May 22.

Meters.

CLACTON URBAN DISTRICT COUNCIL. Tenders by May 22.

Pipes.

CLACTON URBAN DISTRICT COUNCIL. Tenders by May 22.

Tar and Liquor.

BUXTON GAS DEPARTMENT. Tenders by May 27.
LOUGHBOROUGH GAS DEPARTMENT. Tenders by June 9.

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SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

WINKELMANN'S
"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, LONDON, E.C. "Volcanism, London."

TAR WANTED.
THOMAS HORROCKS & SONS, LTD.,
Albert Chemical Works, BRADFORD,
MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Carbolic, Sulphate of Ammonia.

SULPHURIC ACID.

SPECIALLY prepared for Sulphate of AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: OLDBURY, WEDNESBURY, AND STAFFORD.
Address Correspondence and Inquiries to OLDBURY, WORCS.
Telegrams: "CHEMICALS, OLDBURY."

D. ANDERSON AND COMPANY,
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "DACOLIGHT LONDON." Telephone: 2336 HOLBORN.

BRISTOL'S RECORDING GAUGES.

THE MOST EXTENSIVE RANGE OF RECORDING INSTRUMENTS IN THE WORLD.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL, CANNON STREET, LONDON, E.C.
Recording Pressure Gauges.
Recording Vacuum Gauges.
Combination Recording Pressure and Vacuum Gauges.
Recording Draught Gauges.
Recording Hydraulic Pressure Gauges.
Recording Water Level Gauges.
Recording Thermometers.
Indicating Electric Pyrometers.
Recording Electric Pyrometers.
Recording Milli Voltmeters for stray currents in gas-mains.
Long Distance Recording Tachometers, &c., &c.

SPENCER'S PATENT HURDLE GRIDS.

THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement, April 4, p. 75.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, SUNDERLAND, and WAKEFIELD.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

OXIDE OF IRON (BOG ORE)
ANY QUANTITY. ANY PORT. ANY STATION.
DONALD M'INTOSH,
110, CANNON STREET, LONDON.

BENZOL
AND
CARBURINE FOR GAS ENRICHING.
ALSO
THE MAXIM PATENT CARBURETTOR.

For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.
126, BISHOPSGATE, E.C.
Telegraphic Address: "Carburine, London."

COAL TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

R. & G. HISLOP,
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL TESTING PLANT, BOILER FIRING.
Communications should be addressed to UNDERWOOD HOUSE, PAISLEY.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

GAS OILS.
MEADE-KING, ROBINSON, & CO., Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, EXCHANGE STREET, MANCHESTER, and TOWER BUILDING, 22, WATER STREET, LIVERPOOL.

BROTHERTON & CO., LIMITED.
Offices: City Chambers, LEEDS.
Correspondence invited.

PATENTS AND TRADE MARKS PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d. "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS-WORKS requiring Extensions should Communicate with FIRTH BLAKELEY, SONS, AND CO., LIMITED, Dewsbury, who make a Speciality of Catering for the Smaller Gas Concerns. Prices Reasonable; quality and results, the *best*. Satisfaction Guaranteed.

AMMONIA.
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

OXIDE OF IRON.
SPENT OXIDE PURCHASED.
BALE'S FIRE CEMENT.
PAINT FOR GAS-WORKS.
"KLEENOFF," THE COOKER CLEANER.
BALE & CHURCH,
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD., 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHURIC ACID — Specially pre- pared for Sulphate of AMMONIA and BENZOL Recovery Plants. JOHN NICHOLSON & SONS, LTD., Hunslet Chemical Works, LEEDS. Tele.: "NICHOLSON, LEEDS." Telephone: (Two lines), Nos. 2420 and 2421.

SULPHATE OF AMMONIA SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.
Telegrams: "SATURATORS, BOLTON." Telephone 0848.

GAS PLANT for Sale—We can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
FIRTH BLAKELEY, SONS, AND COMPANY, LIMITED, Church Fenton, near LEEDS.

"GAZINE" (Registered in England and Abroad). A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. BOURNE, West Moor Chemical Works, KILLINGWORTH, or through his Agent, F. J. NICOL, Pilgrim House, NEWCASTLE-ON-TYNE.
Telegrams: "DORIC," Newcastle-on-Tyne. National Telephone No. 2497.

AMMONIACAL Liquor wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, SUNDERLAND, AND WAKEFIELD.

WANTED—Tar and Ammoniacal Liquor. Any Quantity.
GRINDLEY AND COMPANY, LIMITED, Rawcliffe, near Goole, YORKSHIRE.

"GUIDE to Patents, Trade Marks and DESIGNS," 1910. 4th Edition. Contains concise information on British, Colonial, and Foreign Patents, &c. All Inventors and those interested should send for free copy to J. S. WITHERS & SPOONER, Chartered Patent Agents, 323, High Holborn, LONDON. 'Phone.: 480 HOLBORN. Telegrams: "Improvably, London."

AMMONIA Waste Liquor Disposal.
Purification Plant.
Results Guaranteed. No Working Costs.
JOHN RADCLIFFE, Chemical Engineer, EAST BARNET.

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

WILL the Gentleman who took the WRONG OVERCOAT away in Error at the close of the NORTH of ENGLAND GAS MANAGERS' ASSOCIATION DINNER kindly RETURN same to the Manager of the County Hotel, Newcastle-on-Tyne, when his own will be returned in Exchange.

AMMONIACAL Liquor wanted. CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.
Telegrams: "CHEMICALS."

PATENT SATURATOR.

GREAT Improvement in the Ammonia Distributing Pipe to prevent Bulging, Bursting, and to ensure more equal Distribution of the Ammonia Gas into the Liquor (Great Economy).
Particulars of Leadburner P. J. DAVIES, 118, Galloway Road, SHEPHERD'S BUSH.

WANTED, by a Gentleman recently returned from the U.S.A., the MANAGEMENT of a small Works where small CAPITAL could be INVESTED. Ten Years' Experience in all Departments of Works, Distribution, and New Business.
Address, No. 5402, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SULPHATE of Ammonia Saturators and Lead Work (Repairs, &c.). Leadburner and Chemical Plumber of Great Experience. Workmanship Guaranteed. Disengaged. Any Distance, with or without Plant. Has worked for Principal Firms, with 20 Years' References. Erecting. Jobbing done, &c.
DAVIES, 118, Galloway Road, SHEPHERD'S BUSH.

GENERAL Agent of Factories for Articles concerning Gas Industry, having Office and Store in Paris, wishes REPRESENTATIONS exclusively for France.
Address G. MARGUERITTE, 11, Rue St. Augustin, PARIS.

RETIRED Ammonia and Chemical Manufacturer, having long Connection and Experience with Gas Undertakings in the Midlands, desires communication with Firms requiring REPRESENTATION.
Address No. 5405, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FARNHAM GAS AND ELECTRICITY COMPANY.

WANTED, a Secretary and Gas Manager. Present Annual Make, 60 Millions. Commencing Salary, £250 a Year.
Applications, stating Age and previous Experience, to be made in Candidate's own Handwriting, accompanied by not more than Three *copies* of recent Testimonials, which will not be returned, and addressed to the Chairman, A. J. NASH, Esq., South Street, Farnham, SURREY.
Canvassing any of the Directors by or on behalf of any Candidate will disqualify.

WANTED, a Show-Room Manager. Fully competent. Highest References.
Apply, by letter, stating Wages expected, to No. 5401, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOREMAN Gas-stove Fitter required by a Firm of Gas-stove Manufacturers. Must be thoroughly Practical and Experienced in up-to-date Methods of Fitting and Testing.
Apply, by letter, giving fullest Particulars, to No. 5397, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SHANGHAI GAS COMPANY, LIMITED.

SHOW-ROOM ATTENDANT.

THE services of a smart up-to-date ATTENDANT are required by the above Company.
For Particulars as to Salary, Term of Service, &c., Apply to Mr. H. KING HILLER, 9, Victoria Street, WESTMINSTER, S.W.

BUXTON URBAN DISTRICT COUNCIL.

GAS MANAGER.

THE above Council invite Applications from Fully Qualified and Experienced Gas Engineers for the Post of GAS ENGINEER and MANAGER at the Council's Gas-Works. (Annual make, 115 Million Cubic Feet.)
Applications in Candidates' own Handwriting, stating Age, previous Experience, &c., together with not more than three recent Testimonials, to be forwarded, addressed to the undersigned, on or before Wednesday, the 31st inst., endorsed "Gas Manager."
The Salary will be £150 per Annum, rising by £10 each Year, to £200, with House, Coal, Gas and Water free.
Canvassing, directly or indirectly, will disqualify any Candidate.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 10, 1911.

DISTRICT INSPECTOR.

WANTED, for a town in the Midland Counties, a thoroughly Competent DISTRICT INSPECTOR, at a Commencing Salary of £150 per Annum. Must be of Good Address and capable of controlling Workmen and Advising Consumers on the Advantages of Gas. A thorough practical Knowledge of Main and Service Laying and of every Description of Internal Fitting Work is essential.
Apply, by letter, before May 27, stating Age, Experience, &c., and enclosing *copies* of not more than Three Testimonials of recent date, to No. 5405, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WORKS Foreman required for the Midlands. Must be a Good Carbonizer, and Experienced in Water-Gas Manufacture. Eight Hour Shifts. Salary, £130 per Annum.
Apply, stating Age, Experience, and enclosing *copies* of Testimonials, to No. 5403, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Two or more Second-Hand PURIFIERS, 10 feet to 15 feet square, with Valves and Connections Complete. Must be in Good Condition.
Particulars to G. EVETTS, Palace Chambers, WESTMINSTER.

FOR SALE—6-inch Bridge Pipes, MOUTHPIECES 21 in. by 15 in., ASCENSION PIPES, BRANCH PIPES, and all Accessories for Gas-Making Plant. Price 4s. 6d. per cwt. f.o.r.
Apply to JOHN ADAMS and SONS, Engineers and Merchants, South Street Works, NEWCASTLE-ON-TYNE.
Every kind of Dismantling Work Executed.

FOR SALE, cheap, Six Tangye's Retort MOUTHPIECES and Patent LIDS 21 in. by 14½ in., with 6-inch ASCENSION PIPES, BRIDGE-PIPE, and HYDRAULIC MAIN. Had only four months' work. Also one 200-Light, Dry GAS METER (T.G. & Co.), in thorough good order.
Apply, the MANAGER, Gas-Works, CHERTSEY.

SKIPTON URBAN DISTRICT COUNCIL.

TENDERS FOR GAS COAL.

THE Council invite Tenders for the Supply of about 8000 Tons of best GAS COAL (Screened, Unscreened, and Nuts) to be delivered into the Council's Boats at the Pit Wharf, or at the Railway Station, Skipton, or at the Council's Wharf adjoining the Gas-Works in Skipton, on the Leeds and Liverpool Canal, between June 30, 1911, and July 1, 1912, in Monthly quantities.
Full Particulars as to periods and quantities of Deliveries, &c., and Form of Tender, may be obtained from the Manager, Mr. J. H. Woodward, Gas-Works, Skipton, and Tenders, endorsed "Tender for Gas Coal," are to be sent to the Chairman of the Gas Committee, Gas-Works, Skipton, on or before Saturday, May 27, 1911.
The lowest or any Tender not necessarily accepted.
RICHARD WILSON.
Clerk to the Council

COUNTY BOROUGH OF SMETHWICK.
(GAS DEPARTMENT.)

TENDERS FOR COAL AND CANNEL.

THE Gas Committee invite Tenders for the Supply of about 30,000 Tons of GAS COAL and NUTS and 1000 Tons of CANNEL.
Form of Tender and further Information may be obtained of the undersigned.
Sealed Tenders, endorsed and addressed to the Chairman of the Gas Committee, Council House, Smethwick, to be sent in not later than the 24th inst.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
W. J. STURGES,
Secretary.

Gas Offices, Council House,
Smethwick.

MANCHESTER CORPORATION.
(GAS DEPARTMENT.)

TO IRON AND STEEL WORK CONTRACTORS.

COKE-SCREENING PLANT.

THE Gas Committee are prepared to receive TENDERS for the Supply, Delivery, and Erection of Five STEEL HOPPERS for Coke, with continuous BUCKET ELEVATOR and SCREENING CONVEYOR, together with the necessary Gearing, Shafting, &c., at their Bradford Road Gas-Works.
Specification and Form of Tender may be obtained on Application to Mr. F. A. Price, Superintendent, Gas Department, Town Hall, Manchester, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Drawings may be seen and other Information obtained, on Application to Mr. J. G. Newbigging, M.Inst.C.E., Engineer, at his Office, Rochdale Road Station.
Sealed Tenders, addressed to the Chairman of the Gas Committee and endorsed "Tender for Coke Screening Plant, Bradford Road," must be delivered at the Gas Offices, Town Hall, Manchester, not later than Twelve o'clock noon on Saturday, the 27th of May, 1911.
The Committee do not bind themselves to accept the lowest or any Tender.

By order,
THOMAS HUDSON,
Town Clerk.

Town Hall, Manchester,
May 12, 1911.

WREXHAM GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Wrexham Gas Company are prepared to receive TENDERS for the Supply of 10,000 Tons of Best Approved GAS COALS, to be delivered during the year ending June 30, 1912, in such Quantities and at such times as may be required, and to weigh 20 cwt. to the Ton over the Gas Company's Weighbridge.
Tenders to be accompanied by Practical Working Analysis, stating the Price of Coal delivered: (1) At Wrexham Station (Great Western Railway); (2) At the Gas-Works, Wrexham, free of all Charges.
The Directors do not bind themselves to accept the lowest or any Tender.
Forms of Tender and further Particulars may be obtained from Mr. J. Braithwaite, Engineer and Manager.
Sealed Tenders, endorsed "Tenders for Coal," Specifying the Description and Quality of Coal, to be sent on or before the 1st of June next, addressed to the Chairman, Gas Offices, Wrexham.

WM. HEYWARD,
Secretary.

Gas Offices, Wrexham,
May 5, 1911.

BUXTON URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for:—
(1.) GAS COAL, NUTS, AND CANNEL.
The Supply of 6000 Tons of Best Screened GAS COAL or NUTS, and 3000 Tons of CANNEL, to be delivered, as required, at the Gas Siding, Midland Railway, Buxton, during the Twelve Months ending July 31, 1912, in accordance with the Specification and Conditions, which may be obtained from the Gas Engineer, Mr. H. Barker, Town Hall, Buxton.
Sealed Tenders, endorsed "Coal," or "Cannel," respectively, are to be delivered to the undersigned on or before Saturday, the 27th inst.
The Committee do not bind themselves to accept the lowest Tender, and reserve the right to divide the Contract.
(2.) SURPLUS TAR AND AMMONIACAL LIQUOR.
The Purchase of the Surplus TAR, and the whole of of AMMONIACAL LIQUOR which may be produced at the Buxton Gas-Works during the Twelve Months ending June 30, 1912; the same to be delivered into Contractor's Tanks at the Gas Siding, Midland Railway, Buxton.
Sealed Tenders, endorsed "Tar," and "Liquor," respectively, are to be delivered to the undersigned on or before Saturday, the 27th inst.
Forms of Tender may be obtained on Application to the Gas Engineer.

By order of the Committee,
(Signed) JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
May 13, 1911.

CLACTON URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THE above Council are prepared to receive TENDERS for RE-SETTING Two Beds of REGENERATIVE RETORTS.
Copy of Specification and Form of Tender may be obtained of the Council's Consulting Engineer, Mr. Sydney Francis, A.M.I.M.E., Town Hall Buildings, Clacton-on-Sea.
Sealed Tenders, endorsed "Resetting Retorts," to be delivered to the undersigned not later than Noon on Thursday, the 25th of May, 1911.
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, May 12, 1911.

CLACTON URBAN DISTRICT COUNCIL.

TENDERS FOR ANNUAL SUPPLIES, CARTING, &c.

THE above Council invite prices for the Supply of the following GOODS and MATERIALS during the ensuing Year:
Ironmongery, Brooms, Oilman's Goods, &c.
Toilet requisities for public lavatories.
Washing Towels, &c.
House Coal.
Meat, Groceries, Bread, Provisions, Milk, &c., for the Isolation Hospital.
Oils.
Cotton Waste.
Gas-Meters.
Gas Barrel.
Bitumen.
Electrical Service Fittings.
Electrical Joint Box compound.
Gas Mantles, &c.
Timber.
Lime.
Bricks.
Cement.
Ballast.
Hoggin.
Disinfecting Fluid, Powder, &c.
Water Stop-Cock Covers.
Prices are also invited for:—
Team Hire.
Carting and Labour.
Pick Sharpening and Laying.
Horse Shoeing, &c.
Tenders must be sent on the prescribed Form, which can be obtained of the undersigned, to whom Tenders must be delivered not later than Noon, on Monday, the 22nd of May, next, under sealed cover, endorsed "Tender for Annual Supplies."
The Council do not bind themselves to accept the lowest or any Tender.

GEO. T. LEWIS,
Clerk to the Council.

Town Hall Buildings,
Clacton-on-Sea, May 12, 1911.